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REVIEW
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HILDEBRAND (A. A.). **Observations on the occurrence of the stem canker and pod and stem blight fungi on mature stems of Soybean.**—*Plant Dis. Reptr*, 38, 9, pp. 640–646, 7 figs., 1 graph, 1954. [Multilithed.]

At the Science Service Laboratory, Harrow, Ontario, mature soybean stems kept for three or four weeks in a humid atmosphere yielded *Phomopsis* pycnidia and both scattered and caespitose perithecia. Monoascospore cultures from stems with scattered perithecia gave rise to *Phomopsis* isolates believed to be the imperfect state of *Diaporthe phaseolorum* var. *sojae* [*R.A.M.*, 34, p. 126]. From stems with either caespitose or apparently more dispersed perithecia monoascospore isolates produced, in addition to perithecia of *D. p.* var. *batatatis* [loc. cit.], conidia of the *Phomopsis* type, in some cultures borne sparsely on the mycelium, in others in locules in ectostromatic bodies. This appears to be the first report of an imperfect state of *D. p.* var. *batatatis*.

VAN DOORN (A. M.), KOEBT (J. L.), & VAN DER VLIET (M.). **Valse meeldauw in Uien en Sjalloten.** [Downy mildew in Onions and Shallots.]—*Meded. Dir. Tuinb.*, 17, 6, pp. 432–436, 1954.

Downy mildew (*Peronospora destructor*) is stated to be a regular source of more or less severe damage to onions and shallots in Holland [*R.A.M.*, 31, p. 478]. In five years' experiments with fungicides the best control was given by spraying with 2 per cent. zineb applied at the rate of 150 l. per ha., with the addition of 1 in 4,000 of a Grasselli spreader. The first treatment should be made before the symptoms appear on main-crop onions and repeated at seven- to ten-day intervals, according to weather conditions.

Main-crop onions should not be grown near stands intended for seed production or adjoining fields of high-growing crops like maize; infected bulbs should be rogued out and destroyed as soon as possible; and nitrogenous fertilizers should be applied sparingly.

ULLRICH (J.). **Untersuchungen über Salatmosaik. (Vorläufige Mitteilung).** [Studies on Lettuce mosaic. (Preliminary communication).]—*NachrBl. dtsch. PflSch-Dienst* (*Braunschw.*), *Stuttgart*, 6, 12, pp. 182–184, 3 figs., 1954.

Lettuce mosaic virus is responsible for heavy losses in Germany [*R.A.M.*, 32, p. 534], especially in the summer crop. In August, 1954, for instance, the incidence of infection in nearly all the stands in Rhineland-Palatinate and round Stuttgart reached 70 to 100 per cent. The virus is readily transmissible by mechanical methods to *Gomphrena globosa*, *Chenopodium urbicum* (abs. in *Phytopathology*, 42, p. 478, 1952), and a yellow Australian lettuce which reacted by conspicuous striate necroses on the leaves produced after inoculation. *Myzodes* [*Myzus*] *persicae* is the principal aphid vector. Of 28 lots of commercial summer seed inspected at the Neuss-Lauvenburg branch of the Biological Institute, 18 harboured up to 2·3 per

cent. infection. On 8th July a completely isolated plot of the Folger variety grown from seed with 1·2 per cent. infection was 60 per cent. diseased as a result of spread by aphids. From this period onwards the population of *M. persicae* increases and during August entire stands may be contaminated through their agency. Rapid progressive spread of the virosis also results from the cultivation in adjacent plots or in alternate rows of plants of different ages.

Morwood (R. B.). **Plant protection. Peanut diseases.**—*Qd agric. J.*, 79, 5, pp. 267–270, 2 figs., 1954.

In these notes on groundnut diseases in Queensland [*R.A.M.*, 25, p. 248] it is stated that the most serious is crown rot (*Aspergillus niger*) [34, p. 125]. Both this type of rot and seed rot in the ground, caused by *A. niger* and other fungi, including *Rhizopus arrhizus* [loc. cit.], are favoured by injuries to the seed coat and are also much more serious in old cultivations than in land recently broken up from grass.

Wilt (*Fusarium* sp. or *Verticillium* sp.) [25, p. 248] seldom reaches serious proportions, and can usually be kept in check by crop rotation.

Leaf spot (*Cercospora personata* and *C. arachidicola*) [loc. cit.] may be controlled by three to five applications of a copper-sulphur dust at intervals of seven to ten days, starting at flowering.

The crop is affected by three diseases considered to be of virus origin. In chlorosis [loc. cit.] the leaflets are puckered and yellowing is present in irregular blotches or concentric rings; later, the yellowed areas wither and affected plants are dwarfed. In bunchy plant [loc. cit.] the leaves are small, the internodes shortened, and the axillary buds extensively developed. The floral parts are green and proliferated and the whole plant may be pale green. Plants affected by leaf curl [loc. cit.] have thick, brittle, fleshy, backward-curved leaves with light green streaks.

Barnes (W. C.) & Epps (W. M.). **An unreported type of resistance to Cucumber downy mildew.**—*Plant Dis. Reptr*, 38, 9, p. 620, 1954. [Multilithed.]

Inoculation experiments and field observations at Clemson College Truck Experiment Station, Charleston, South Carolina, revealed a new type of 'brown lesion' resistance to downy mildew (*Pseudoperonospora cubensis*) [*R.A.M.*, 33, p. 72] in the cucumber accession P.I. 197087 [32, p. 465]. The spots were small and brown instead of yellow and the tissues usually died soon after infection, sporulation being sparse. Lines heavily inoculated in the seedling stage and at first regarded as only moderately resistant because of the dead cotyledonary tissues were rated as highly resistant later in the season.

Godfrey (G. H.). **Cantaloupe downy mildew in the Lower Rio Grande Valley of Texas and its relation to relative humidity.**—*Plant Dis. Reptr*, 38, 9, pp. 616–619, 1 graph, 1954. [Multilithed.]

The reappearance in 1954 of cantaloupe downy mildew (*Pseudoperonospora cubensis*) in a severe form in the Lower Rio Grande Valley of Texas [*R.A.M.*, 25, p. 200] after an apparent absence of three years was due to the unusually wet and humid spring. A comparison of the 1954 data with those of previous years showed a relation between incidence and high early morning relative humidity. The possibility of applying daily weather reports to better advantage in timing fungicidal applications is discussed and a closer co-operation with the Weather Bureau and the Extension Service is advocated. The establishment of a downy mildew spray warning service which might develop into a general plant disease warning service for the area is recommended [cf. 32, p. 615].

Crossan (D. F.), Haasis (F. A.), & Ellis (D. E.). **Phytophthora blight of summer Squash.**—*Plant Dis. Reptr*, 38, 8, pp. 557–559, 2 figs., 1954. [Multilithed.]

This information on the occurrence of *Phytophthora capsici* on summer squash in North Carolina has already been noticed from another source [*R.A.M.*, 33, p. 520].

Benzoni (C.). **Appunti su diversi mutamenti dei Vigneti del Cantone Ticino meridionale e la comparsa di alcune specie di Pionnotes (Fries).** [Notes on various changes in the vineyards in the south of the canton of Ticino and the appearance of some species of *Pionnotes* (Fries).]—*Schweiz. Z. Pilzk.*, 32, 10, pp. 155–158, 2 figs., 1954.

Looking back over a period of 50 years, the author observes a number of changes in the vineyards of southern Ticino, Switzerland. For instance, certain species of *Vitis* are being destroyed by pathogenic fungi, e.g., *Uncinula necator*, *Plasmopara viticola* [see next abstract], *Pseudopeziza tracheiphila*, and ? *Guignardia bidwellii* [C.M.I. map No. 81], and it is planned to save the remaining vines by grafting with the more resistant American *V. aestivalis*, *V. labrusca*, and *V. rotundifolia*. Two important varieties, Margellana and Bonarda, highly prized in the wine industry, have virtually disappeared from the region.

In 1930 *Pionnotes biasolettiana* var. *sanguinea* (Fr.) Ferri = *P. sanguinea* (Fr.) Sacc. [*Fusarium avenaceum*, fide Wollenweber] was found growing on old excised branches or emerging from the cortex of Bonarda vines in sheltered sites on calcareous soil. Its life-history and morphology are briefly described and its points of difference from *P. biasolettiana* (Corda) Sacc. [*F. merismoides* fide Wollenweber] noted. The latter is not uncommon on cut stumps of birch, walnut, mulberry, ash, *Sophora japonica*, *V. labrusca*, and *V. rotundifolia*, while the rare species *P. flavicans* Sacc. & D. Sacc. [*F. graminearum*, fide Wollenweber] occurs on *Bambusa arundinacea* and *Clematis vitalba*.

Blumer (S.) & Kundert (J.). **Die Eignung von Kupfer und organischen Präparaten für die Bekämpfung der Peronospora im Weinbau.** [The suitability of copper and organic preparations for the control of *Peronospora* in viticulture.]—*Annu. agric. Suisse*, N.S. 3 (68), 3, pp. 267–289, 1 fig., 5 graphs, 1954. [French summary.]

Much of the information in the authors' survey and discussion of 37 contributions to the literature on the influence of copper on fungi and plants, particularly in relation to the control of vine downy mildew (*Peronospora* [*Plasmopara*] *viticola*) [see next abstract] and the effects of organic preparations on the vine and its diseases, has already been presented in this *Review* from other sources.

At the Wädenswil Experiment Station, Zürich, Switzerland, combinations of copper carbonate with captan and of copper oxychloride with zineb exerted a powerful synergistic action on the germination of *Alternaria tenuis* spores in laboratory tests [cf. *R.A.M.*, 29, p. 420], and in the field they have been reported highly satisfactory against mildews. *P. viticola* is controllable by either captan or zineb alone [cf. 33, pp. 10, 278, 283], but they both permit the development of heavy infection by *Oidium* [*Uncinula necator*], a disadvantage that is largely outweighed by the admixture of copper.

Sy (M.). **Über Synergismus und Antagonismus von Kupfer und Schwefel in der fungiziden Wirkung auf Peronospora (Plasmopara viticola de Bary).** [On synergism and antagonism of copper and sulphur in relation to fungicidal action on *Peronospora* (*Plasmopara viticola* de Bary).]—Reprinted from *Wein-Wiss.* (*Beih. Dtsch. Weinb.*), 8, 3, 7 pp., 1954.

An account is given of experiments carried out in Germany during 1953 to reconcile conflicting opinions as to the influence on the efficiency of copper-containing

preparations (represented by a copper oxychloride, OB 21), of an admixture of wettable sulphur (cosan) in the control of vine downy mildew (*Plasmopara viticola*) [*R.A.M.*, 29, p. 8; 33, p. 10]. The efficacy of OB 21 (0·2 or 0·5 per cent.) was substantially enhanced by the addition of 0·2 per cent. cosan in a schedule of six treatments beginning on 17th July and ending on 3rd September.

TURIAN (G.). **Récents progrès de la lutte contre le coître de la Vigne.** [Recent progress in the control of the white rot of Vine.]—*Rev. rom. Agric.*, 10, 2, pp. 12–14, 1954.

Investigations on the life-cycle of *Coniella* [*Coniothyrium*] *diplodiella* [*R.A.M.*, 29, p. 286 and following abstracts] have shown that the pycnidia of the fungus may discharge into the surrounding soil about 80,000 spores from each fallen grape. The spore population of the soil therefore depends on the number of rotted grapes with pycnidia falling into it. Vineyard soil may contain 100 to 400 spores per gm. soil, the maximum observed so far being 2,000.

Once the new fruits are contaminated, prevention of infection is practically impossible, as the period of incubation of the spore is only 12 hours in the lesion, and when the germ-tube has penetrated the flesh it is beyond the reach of the fungicide. Experiments with some of the newer fungicides, following artificial infection at the Pully branch of the Federal Agricultural Experiment Station, Lausanne, in 1953, gave poor results.

Efforts have therefore been concentrated upon killing the spores in the soil [cf. 15, p. 200]. Prevention of contamination from the soil by providing a cover crop of grasses appears impracticable. The use of antagonistic micro-organisms (*Chaetomella* sp., *Fusarium* sp., *Penicillium* sp.) has not been satisfactory owing to their germistatic rather than germicidal effect. The introduction of manure rich in straw seems to be promising: it would encourage the multiplication of cellulolytic micro-organisms. Chemical treatments of the soil surface to kill the spores are now being investigated.

TURIAN (G.) & LEYVRAZ (H.). **Une nouvelle arme chimique contre le coître (Coniella) de la Vigne.** [A new chemical weapon against white rot (*Coniella*) of Vine.]—*Rev. rom. Agric.*, 10, 12, pp. 97–98, 1954.

The authors review tests carried out by the Swiss Federal Agricultural Experiment Station, Lausanne, in 1954, to ascertain the best method of controlling the white rot of vine (*Coniella*) [*Coniothyrium diplodiella*: see preceding and next abstracts]. Soil treatment to a depth of about 5 cm. with thiram (4 kg. powder per are) in an experimental vineyard at Pully gave practically total disinfection, as demonstrated by dipping artificially wounded grapes into aqueous suspensions of the treated soil, the percentage efficacy 40 days after treatment being maintained at 94. The effect of the disinfectant continues as long as the soil remains undisturbed by tillage. Unfortunately this method is too expensive for large-scale application.

Curative treatments at Dézaley and Plantaz six to 13 hours after a hailstorm in mid-August showed 0·5 per cent. captan to be efficacious (73 per cent.), being more stable and also less expensive than 0·5 per cent. liquid tumex plus wetter (58·2). Liquid treatments were more effective than the corresponding amount of fungicide in powder form (tumex 27·7) [cf. 29, p. 286], as the liquid probably helps to carry the active ingredients to the parasite in the epidermal wounds made by the hail. It is stressed, and this is considered to be the only inconvenience of the method, that to be effective it must be applied within 12 to 14 hours of the hailstorm, i.e., before the spores germinate and their tubes penetrate into the fruit flesh.

Turian (G.). **'Effet d'épargne' de l'asparagine vis-à-vis de la biotine chez Coniella diplodiella.** ['Economizing effect' of asparagine in relation to biotin in *Coniella diplodiella*.]—*Phytopath. Z.*, 22, 2, pp. 211–214, 1954.

At the Federal Agricultural Experiment Station, Lausanne, *Coniella* [*Coniothyrium*] *diplodiella*, the agent of 'coître' or white rot of the vine in Switzerland [see preceding abstracts], showed absolute and conditional deficiencies for thiamin and biotin, respectively, in pure culture. In the presence of asparagine, however, the biotin requirements of the fungus are limited to the traces occurring as impurities in the medium. These observations confirm the unpublished results obtained by C. Terrier in 1948.

Coombe (B. G.). **Last season's experience with PCPA on Currants.**—*J. Dep. Agric. S. Aust.*, 58, 3, pp. 126–127, 1954.

The results of the fungicide trials conducted in South Australia in 1953 indicated that vines sprayed with PCPA (*p*-chlorophenoxyacetic acid) or BTO (benzothiazol 2-oxyacetic acid) for fruit set are more susceptible to black spot (*Elsinoe*) [*ampelina*: *R.A.M.*, 33, pp. 67, 468; 34, pp. 128, 129] in the rainfall areas, but not to other fungal diseases, such as *Oidium* [*Uncinula necator*: 29, p. 402].

Nadal Giró (R.). **Experiencias en el tratamiento del mildiu de la Vid, sin utilizar productos cúpricos.** [Experiments on the treatment of Vine mildew without using copper products.]—*Rev. Inst. agríc. catal.*, 103, 12, pp. 331–332, 1954.

During 1954 excellent control of vine *Oidium* [*Uncinula necator*] was secured on about 8 ha. of three- to seven-year-old vines near Panadés, Spain [*R.A.M.*, 32, p. 419], by applications of dithane Z-78 [33, p. 701], there being no difference between these and others sprayed entirely with Bordeaux mixture or other copper compounds. In fact the dithane-treated vines appeared superior in general health. With both dithane and copper 15 treatments were applied in all, being repeated from the first two weeks in May at weekly intervals until the beginning of July, when the disease was so severe that two were given that week. A tractor-drawn Lachazette machine and about 20 atm. pressure was used throughout. The vines retained their colour with no burning of the leaves.

Sardiña (J. R.). **Las conferencias de virologia del Prof. K. M. Smith.** [Professor K. M. Smith's lectures on virology.]—*Bol. Inst. Invest. agron., Madr.*, 14, 30, pp. 263–273, 1954.

Summaries are presented of six of the seven lectures on virology given by Professor K. M. Smith at the Council of Scientific Investigations, Madrid, the first being omitted since the generalities with which it dealt are well known. The second was concerned with insects in relation to plant viruses; the third with the purification and electron microscopy of plant viruses; the fourth and fifth with virus diseases of insects; the sixth with some important virus diseases of agricultural crops, their modes of transmission, and control; and the seventh with latency in viruses.

Suhov (K. S.). Вирусные болезни сельскохозяйственных растений и меры борьбы с ними. [Virus diseases of agricultural plants and their control.]—Изв. Акад. Наук СССР [*U.S.S.R. Acad. Sci. News* = *Bull. Acad. Sci. U.S.S.R.*], *1954*, 3, pp. 49–61, 1 pl., 1954.

In this review of the literature (32 titles) on virus diseases of agricultural plants in the U.S.S.R. the importance of controlling the following diseases, which are briefly described, is emphasized: tobacco mosaic virus [*R.A.M.*, 32, p. 345; 34, p. 207], mahorka tip chlorosis [34, p. 188], cotton leaf curl virus [18, p. 698],

oat zakuklivanie [pseudo-rosette virus: 23, p. 210], wheat mosaic virus [24, p. 400], citrus psorosis [33, p. 670], tomato stolbur [tomato big bud] on tomato [32, p. 153], [chilli] pepper [24, p. 400], eggplant [loc. cit.], and potato [34, p. 171], tomato mosaic virus [? tobacco mosaic virus: 24, p. 400] and tomato streak virus [23, p. 219] on tomato, cucumber mosaic 2 [strain of cucumber mosaic virus: 34, p. 207], potato streak [potato aucuba mosaic virus: 24, p. 400], and potato rugose mosaic virus [mixture of potato viruses X and Y: loc. cit.; cf. 33, p. 509].

DALE (W. T.). **Sap-transmissible mosaic diseases of solanaceous crops in Trinidad.**—*Ann. appl. Biol.*, 41, 2, pp. 240–247, 1 pl., 1954.

Host reactions and properties are given of two further sap-transmissible viruses of solanaceous plants found in Trinidad [*R.A.M.*, 23, p. 202], [chilli] pepper vein-banding virus (Ferguson's 'pepper mosaic') [30, p. 450], common in *Capsicum annuum* and *C. frutescens* and also affecting tobacco, and eggplant mosaic [loc. cit.], which also affects tomatoes occasionally.

On most pepper varieties pepper vein-banding virus produced slight vein-clearing of the expanding leaves in seven to ten days, followed by mottling, which generally developed into an irregular, discontinuous, dark green vein-banding, often bordered by chlorotic areas. Crinkling and dwarfing of the lamina were also present. Puerto Rico Wonder and certain local red- and yellow-fruited hot peppers (*C. annuum* var. *minimum*) developed only milder leaf symptoms, and Puerto Rico was more difficult to infect; perennial small-fruited bird peppers and cherry peppers (*C. frutescens*) often showed leaf symptoms only. Young plants of the Large Bell Hot variety of *C. annuum* displayed dark brown vein-necrosis of the developing leaves four to eight days after sap inoculation, followed swiftly by necrotic streaking of the stem and abscission of all but the oldest leaves, and later by the death of the plant. Older plants became chlorotic, developed necrosis of the active shoots, and shed their fruits, but frequently survived for some time in a moribund condition. Certain hybrids between Large Bell Hot and other varieties were stunted and yielded little or no fruit; the leaves, which were small, mottled, and curled downwards, displayed varying degrees of vein-necrosis.

On field tobacco there are dark green, sometimes ill-defined blotches along the veins. Young White Burley plants inoculated in the glasshouse developed vein-clearing followed by discontinuous dark green vein-banding, sometimes bordered by chlorotic areas which merged into the normal leaf colour. Almost identical reactions were given by *Nicotiana tabacum* var. *macrophylla*, *N. chinensis*, and *N. sylvestris*. The lesions on *N. alata* var. *grandiflora*, *N. glutinosa*, *N. rustica*, and *N. sanderae* differed only in degree. On petunia and *Physalis floridana* symptoms were more conspicuous than on most of the *N.* spp. Celery, cucumber, pumpkin, *Chenodopodium hybridum*, bean (*Phaseolus vulgaris*), and zinnia were not susceptible.

Eggplant mosaic virus causes yellowish local lesions up to 3 mm. across on inoculated plants after two to four days. Vein-clearing of the expanding leaves, including the inoculated one if small, appeared in four to eight days, followed by mottling which finally took the form of broad, irregular, dark green vein-banding. Variation in symptom intensity occurs, especially in the field. Mottling may be only faint, but sometimes the interveinal areas, of the lower leaves in particular, turn yellow. Infection of young plants temporarily checks growth. The few tomato plants found naturally infected also harboured twisted leaf virus [loc. cit.]. The double infection produced severe stunting. The leaves were curled and had whitish-yellow interveinal flecks. In a field trial during the dry season eggplant mosaic alone reduced yield by 25 per cent. and the two viruses together by 46 per cent. In petunia eggplant mosaic virus caused chlorotic local lesions followed successively by yellowish vein-banding and coarse pale and dark green leaf-mottling, the latter becoming almost a dark green vein-banding. On *Physalis floridana* there were

yellow local lesions 1 to 2 mm. across, and a rather mild form of coarse mottling. Young White Burley tobacco plants developed circular chlorotic local lesions 1 to 3 mm. across, sometimes with necrotic margins. *Chenopodium hybridum* developed necrotic local lesions about 1 mm. across and systemic chlorotic ring-spots, some of which became necrotic from the centre. Systemic spots were sparse on young leaves, but became more numerous as the leaves matured; sometimes they coalesced, forming a yellowish mottling. Some variation in the type of systemic symptoms occurred in this host, as in *N. glutinosa* [loc. cit.]. The primary leaves of young Black-eye cowpeas developed reddish-brown necrotic spots 1 to 2 mm. across. The virus was recovered from inoculated leaves of cucumbers, which remained symptomless, but celery, pumpkin, and zinnia were not infected.

Heat inactivation of eggplant mosaic occurred at 78° C.; longevity *in vitro* at 25° to 30° was over 21 days and for the pepper virus 6 days.

Both viruses are much more prevalent locally than tobacco mosaic virus. Neither is seed-borne, but they generally appear early and spread quickly. Pepper vein-banding virus is transmitted by *Aphis gossypii*, eggplant mosaic by flea beetles (*Epitrix* sp.).

Hutton (E. M.). **Ploidy and virus reaction in Physalis floridana Rydb.**—*Aust. J. agric. Res.*, 5, 3, pp. 349–355, 1954.

At the Division of Plant Industry, Canberra, the effect of ploidy [cf. *R.A.M.*, 30, p. 75] on growth was studied in relation to the reaction to virus diseases of diploid plants of *Physalis floridana* and the induced autotetraploid. Increased ploidy did not affect the reaction to the mesophyll viruses potato X and tomato spotted wilt but markedly increased sensitivity to potato leaf roll virus. In one experiment in winter, plots of 50 plants were inoculated by transfers of *Myzus persicae* at the seedling stage, and all the plants developed leaf roll symptoms within three weeks. After three months 50 per cent. of the tetraploid plants were killed; the remainder were only 2 in. high and had failed to flower. Only 12 per cent. of the diploids died, the remainder reaching a height of 6 in., most of them setting seed. Phloroglucinol staining of stem sections revealed more extensive phloem necrosis in the tetraploids than in the diploids.

In a further experiment inoculation at the third true-leaf stage reduced the mean fresh weight of both diploid and tetraploid plants, the reduction in the latter being twice that in the former. No reduction occurred in the mean weight of diploid plants when infection occurred at the sixth-leaf stage, though the mean weight of the tetraploids was reduced by 24·9 per cent.

Other experiments showed that eight weeks afforded ample time for the leaf roll reaction to develop fully; they also demonstrated that the later the growth-stage used for inoculation the smaller the effect. Inoculation at flowering caused no observable reduction in tetraploids or diploids. In all the experiments tetraploids were more sensitive indicators of leaf roll than diploids.

Kahn (R. P.) & Schachtner (N. D.). **The relative effect of rate of drying and potassium phosphate on plant virus infections.**—Abs. in *Phytopathology*, 44, 7, p. 389, 1954.

Inocula of tobacco mosaic, tobacco ring spot, tobacco necrosis, and southern bean mosaic viruses were prepared by extracting desiccated host (bean [*Phaseolus vulgaris*] or cowpea) tissue with distilled water and with 0·1 M potassium phosphate buffer at pH 7 [cf. *R.A.M.*, 31, p. 474]. Celite-dusted primary leaves (500 bean and 250 cowpea) were infected by rubbing with a ground-glass spatula dipped in the inoculum. Tobacco necrosis and tobacco ring spot viruses caused two to three times more infection on cowpeas of the Black variety when the leaves were dried quickly than when dried slowly, regardless of the presence or absence of phosphate.

The effect of drying was also apparent in the case of tobacco mosaic, tobacco necrosis, and southern bean mosaic viruses on Early Golden Cluster or Pinto beans, or both, but only in the absence of phosphate from the inoculum.

BOYLE (J. S.), MOORE (J. D.), & KEITT (G. W.). **Cucumber as a plant host in stone fruit virus research.**—*Phytopathology*, 44, 6, pp. 303–312, 4 figs., 1954.

This is an expanded account of studies at the Department of Plant Pathology, University of Wisconsin, on a virus disease which was readily transmitted to cucumber by mechanical inoculation with expressed sap from the leaves of 66 trees representing 15 species of *Prunus*, including sour cherry, *P. americana*, *P. avium*, *P. padus*, *P. mahaleb*, *P. pumila*, *P. serotina*, *P. virginiana*, and plum infected by cherry necrotic ring spot virus alone or in combination with cherry yellows virus [*R.A.M.*, 28, p. 223; cf. 34, p. 131]. Tested in fresh cucumber extracts, the virus was inactivated by ten minutes' exposure to a temperature of 52° C. and its dilution end point was 1 in 30. Infectivity was lost after 12 hours at room temperature, but the virulence of material dried in fragments of cucumber leaf tissue over calcium chloride at 2° was retained for upwards of 142 days. Among 57 species of plants belonging to 20 families, only cucumber and Giant Summer Crookneck squash were susceptible to the virus, the exact identity of which has not yet been determined.

LING (L.). **International Plant Protection Convention : its history, objectives, and present status.**—*F.A.O. Pl. Prot. Bull.*, 1, 5, pp. 65–68, 1953.

After briefly recapitulating the events that led to the signing of the International Convention for the Protection of Plants at Rome in 1929 and of the Phylloxera Convention at Berne in 1881, the author traces the development of the International Plant Protection Convention, approved by the F.A.O. conference at its sixth session in Rome, November–December, 1951.

The aim of the 1951 Convention is to strengthen international efforts to combat important pests and diseases affecting plants and plant products and to prevent their spread across national boundaries. In its present form the Convention provides only a broad framework, adaptable to changing conditions in the field of plant protection and under which supplementary agreements may be formulated to deal in detail with problems confined to certain geographic areas or to specific subjects. Contracting governments are required to institute a satisfactory national plant protection organization and to co-operate with F.A.O. in establishing a World Reporting Service on plant diseases and pests. Uniform regulatory and quarantine procedures and a model phytosanitary certificate [see next abstract] are supplied in the Convention. The establishment of regional plant protection organizations is provided for, and arrangements have been drawn up for the settlement of disputes. F.A.O. acts as the depository of the Convention and administers its provisions. The Convention has been signed and adhered to by 39 countries.

DE TEMPE (J.). **The certification of seed in international trade for sanitary condition.**—*F.A.O. Pl. Prot. Bull.*, 2, 10, pp. 145–147, 1954.

Two fundamentally different requirements concerning the health condition of seed in international commerce are distinguishable. The government of the importing country may require a certificate of freedom from certain diseases and pests and of conformity with current import quarantine regulations. The purchaser may demand a guarantee that the seed lot does not contain more than a certain percentage of infection.

The International Plant Protection Convention of 1951 provides a model phytosanitary certificate [see preceding abstract] for seed, but to show the degree of

infection present a different kind of certificate is required. This might well be issued by the seed-testing stations and include other necessary information. For international purposes the information must be clear and explicit. The certificates of the International Seed Testing Association might be used, modified to give information on the method of examination, the quantity of seed tested, the organisms looked for, and the amount of each found. Some examples on these lines are given. For this work every official seed-testing station should have a trained plant pathologist on the staff.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 1, 5, pp. 77–78, 1953.

Summaries are given of plant quarantine restrictions published in 1952 in France (overseas territories), Great Britain, India, New Zealand, the Republic of the Philippines, and Venezuela. By the amended re-issue in India of the Destructive Insects and Pests Act, 1914, imported potatoes, except those from Burma, must be accompanied by an official certificate stating that no wart disease (*Synchytrium endobioticum*) has occurred in twelve months within five miles of the field where they were grown. Bulbs or plants of onion, garlic, shallot, leek, and chive must be certified free from smut (*Urocystis cepulae*). The export or transport is prohibited from the States of Orissa and Travancore-Cochin of banana plants or parts or any articles used in packing them on account of bunchy top virus [*R.A.M.*, 33, p. 711]. Notice No. Ag. 5320 dated 12th September, 1952, as published in the New Zealand Gazette No. 61, authorizes the introduction without a permit into New Zealand as from 26th September, 1952, of spawn of the common field mushroom (*Agaricus* [*Psalliota*] *campestris*).

Rolff (S.). **Bestämmelser för import och export av växter.** [Regulations for the import and export of plants.]—*Växtskyddsnotiser, Stockh., 1954*, 2–3, pp. 41–46, 1954.

This paper summarizes current regulations in force in Sweden for the import of plants and plant parts [cf. *R.A.M.*, 33, p. 555]. For most plants health certificates not older than 14 days are required, and two separate samples must be submitted for inspection to the Plant Protection Institute, Stockholm 19. A brief note is given on general export requirements with a summary of British regulations.

Neue Pflanzeneinfuhrverordnung in Österreich! Verordnung des Bundesministeriums für Land- und Forstwirtschaft vom 5. August 1954 über Ein- und Durchfuhrbeschränkungen zur Verhütung der Einschleppung gefährlicher Pflanzenkrankheiten und Pflanzenschädlinge (Pflanzeneinfuhrverordnung). [New plant import ordinance in Austria! Ordinance of the Federal Ministry of Agriculture and Forestry of 5th August, 1954, concerning import and transit restrictions for the prevention of the introduction of dangerous plant diseases and plant pests (plant import ordinance).]—*PflSchBer.*, 13, 11–12, pp. 183–189, 1954.

The following provisions, amending or supplementing those already promulgated [*R.A.M.*, 30, p. 640], occur in the above-mentioned Ordinance. Consignments of potatoes imported into Austria must be free from serious diseases, especially wart (*Synchytrium endobioticum*), which must further have been absent over a radius of at least 2 km. from the site of cultivation during the past five years. Fruit trees and shrubs (except *Castanea*) and strawberry plants must be guaranteed to harbour no virus diseases. Azalea [*Rhododendron*] plants may not be imported without a certificate of freedom from infection by *Septoria azaleae* and *Exobasidium azaleae* [? *E. vaccinii*].

Du Plessis (S. J.). **Dangers attached to the importation of wood and timber.**—*Fmg in S. Afr.*, 29, 340, p. 334, 1954.

The author quotes extracts from Government Notice No. 1282 of 1942 [*R.A.M.*, 24, p. 256] as amended by Government Notice No. 2153 of 1953 regarding the controlled importation of wood and timber into South Africa and emphasizes the need for adhering to their provisions in order to avoid the introduction of pests and diseases.

Ten Houten (J. G.). **Enige resultaten van het werk van I.P.O.-onderzoekers.** [Some results of the work of investigators at the Institute for Phytopathological Research.]—*Meded. Dir. Tuinb.*, 17, 2, pp. 78–93, 5 figs., 1954. [English summary.]

Some of the important recent contributions to the knowledge and control of plant diseases made by members of the staff of the Institute for Phytopathological Research, Wageningen, Holland, have already been noticed in this *Review*. The vector of *Rubus* stunt virus of raspberry [*R.A.M.*, 33, p. 541] is now definitely identified by H. J. de Fluiter and F. A. van der Meer as *Macropsis fuscula*, this being the first record of a cicadellid as a carrier of a virus disease in western Europe.

Further progress has been made in the development of gherkins combining resistance to cucumber mosaic virus with other desirable qualities [32, p. 231], and large-scale tests of F. Tjallingii's F7 of the cross between Tokyo Long Green and Baarlose nietplekker were planned for 1954.

J. C. s'Jacob reports that very exacting tests at Groningen on 354 varieties and hybrid selections of peas led to the production of a superior variety resistant to race 1 of *Fusarium oxysporum* f. *pisi* [34, p. 272], which is already obtainable on the market, and further material now in course of development should be available shortly.

J. P. H. Van der Want reports that *Phaseolus* virus 2 [bean yellow mosaic virus] is readily conveyed from gladioli to beans [*P. vulgaris*: cf. 32, p. 613; 34, p. 229] by aphids, and growers have been advised not to grow these plants in proximity to each other. Insecticidal treatments have given negative results, primarily on account of the unusually brief period—only 15 seconds—required by the vectors, especially *Myzus persicae*, to acquire the virus by feeding. A viruliferous aphid, moreover, can infect at least six plants in succession. Certain bean varieties, e.g., the French Métis, have shown resistance to both mosaic and yellow mosaic viruses.

Plant diseases. The functions and value of plant quarantine. Diseases of Onions.—*Agric. Gaz. N.S.W.*, 64, 3, pp. 140–143, 4 figs., 1953.

A brief account is given of the function and value of the plant quarantine regulations in force in Australia [*R.A.M.*, 30, p. 559] for preventing the introduction of new diseases and the spread of those already established, with specific examples. The need for public co-operation is emphasized.

The most serious disease of onions in New South Wales is downy mildew (*Peronospora destructor*) [29, p. 604]. Others include smudge (*Colletotrichum circinans*), purple blotch (*Alternaria porri*), white rot (*Sclerotium cepivorum*), and [unspecified] bulb rots. Control consists in the use of seed steeped for 25 minutes in hot water (122° F.), not planting onions for several years in infested soil, burning or burying diseased refuse, and curing before marketing to prevent storage diseases.

Plant diseases. Bitter pit of Apples. Brown fleck or internal brown spot of Potatoes. Black rot of Cabbage and Cauliflower.—*Agric. Gaz. N.S.W.*, 64, 4, pp. 215–218, 5 figs., 1953.

The symptoms and control of bitter pit of apples [cf. *R.A.M.*, 33, p. 236]

are outlined; growers in New South Wales are advised to prune lightly, avoid fertilizing during fruit development and excessive irrigation at the approach of maturity, and to delay the picking of susceptible varieties so that the disorder may be detected and its further development in storage controlled.

Internal brown spot of potatoes [cf. 34, p. 59] is most prevalent on light, gravelly soils in New South Wales; all varieties are susceptible and the only means of control is to reduce soil acidity by liming.

In warm, damp weather cabbage, cauliflower, and other crucifers are sometimes severely affected by black rot (*Xanthomonas campestris*) [C.M.I. map No. 136]. Control measures include hot-water treatment of the seed (18 minutes for cauliflower and broccoli and 25 for cabbage and turnip, at 122° F.), sterilization of seedbed soil with formalin, crop rotation, involving the growing of susceptible plants not more than once every three years, and control of the insect vectors.

Plant diseases. Rose wilt virus. Control of black spot of Grape.—*Agric. Gaz. N.S.W.*, 64, 9, pp. 487–489, 5 figs., 1953.

Rose wilt virus [*R.A.M.*, 23, p. 18] was widespread in New South Wales, approaching epiphytotic proportions in the Sydney area, in the spring of 1952. Floribunda roses are highly resistant. The more severe symptoms may be masked in the usually warm Sydney spring and summer weather, and the disease is probably much more common than previously suspected, causing die-back and loss of vigour. All infected plants, however slight the symptoms, should be burned.

Excellent control of black spot of vine [*Elsinoe ampelina*: 34, p. 129] was obtained in spraying experiments with 1½ lb. thiram in 100 gals. water applied two to three weeks before bud opening, at bud-burst, and four weeks later.

Plant diseases. Some chemicals used in plant disease control in N.S.W. Whiptail of Cauliflowers.—*Agric. Gaz. N.S.W.*, 64, 6, pp. 305–308, 311, 3 figs., 1953.

The fungicides of major agricultural importance in New South Wales are classified under inorganic, including copper, mercury and sulphur, and organic compounds, with notes on their respective uses.

Whiptail of cauliflower, a symptom of molybdenum deficiency [*R.A.M.*, 29, p. 407], occurs in New South Wales throughout the central coastal area, particularly round Windsor, Richmond and on the south-western outskirts of the Sydney metropolitan area.

Plant diseases.—*Agric. Gaz. N.S.W.*, 65, 5, pp. 250–253, 8 figs., 1954.

J. Walker reports that the first outbreak in Australia of antirrhinum rust (*Puccinia antirrhini*) in 1952 [*R.A.M.*, 33, p. 591 and below, p. 285] was not, as first assumed, of European origin, but caused by a race similar to the American race 2. Antirrhinum varieties resistant to the European races are susceptible to this race. Sulphur dusts or sprays should be applied to both leaf surfaces once a week from the time the plants are a few inches high until the flower buds are about to open.

Some non-parasitic diseases of potato tubers are described, including black heart and enlarged lenticels. Hollow heart [31, p. 510] results from excessive or uneven growth. Sequoia is sometimes affected when conditions are apparently normal throughout the growing season. Brown fleck is more prevalent on light soils and in dry seasons.

Plant disease survey for the twelve months ending 30th June, 1953. Twenty-third Annual Report N.S.W. Department of Agriculture. Biological Branch. Division of Science Services.—38 pp., 1 map. [? 1954. Mimeographed.]

In this report [cf. *R.A.M.*, 33, p. 210] it is stated that an increase in the incidence of wheat bunt (*Tilletia caries* and *T. foetida*) [33, p. 594] in the 1952–3 crop caused the

rejection of 40,000 bush. and it seems probable that insufficient fungicide was used in dusting the seed. Very little stem rust (*Puccinia graminis*) [loc. cit.] was observed in the generally susceptible north-west area, probably due to a succession of cold nights in late spring.

Early maturing maize hybrids on the south coast were affected by *Helminthosporium turcicum* [32, p. 676], resulting in losses of 15 per cent. In the Taree district necrosis of the leaf edges and stunted growth in maize were associated with molybdenum deficiency.

The incidence of Fiji disease of sugar-cane [32, p. 174] was lower than usual, losses amounting to only 21 tons.

Red clover anthracnose (*Colletotrichum trifolii*) [cf. 33, p. 676] was found for the first time in New South Wales in the Singleton district and at Camden and Murwillumbah following abnormally warm, wet weather in December and January. Second-year stands were the most severely affected. It is suggested that *C. trifolii* has actually been present for some time, contributing annually to decline of the crop.

Sphaerella [*Mycosphaerella*] *linorum* [cf. 33, p. 209] was again present on linseed in the north-west but caused little damage.

Lucerne downy mildew (*Peronospora trifoliorum*) [cf. 31, p. 475] was severe where crops had been left too long before being cut.

Further citrus losses from *Phytophthora citrophthora* [33, p. 210] following flooding were reported. In the Windsor and Penrith areas extensive replanting on *Poncirus trifoliata* rootstock is in progress. Black spot (*Guignardia citricarpa*) [30, p. 566] caused slight losses in unsprayed orchards but spraying gave control. Medium to heavy losses of Emperor mandarins due to (?) bacterial brown spot [33, p. 210] again occurred in the lower Portland and Windsor districts. A number of orchards in the Murray River district reported high incidence of citrus scaly butt virus [see below, p. 296] in Valencia oranges on *P. trifoliata* stock. Seedling rough lemon trees in several areas were affected by knobby bark, of unknown etiology; swellings first appear on year-old twigs and develop into gall-like growths covered with normal bark.

The apple variety Willie Sharp sustained severe losses due to ripe rot (*Gloeosporium*) when over-mature fruit was left on the trees. Nine pear orchards were affected by the stony pit virus [cf. 28, p. 631], up to 100 per cent. infection occurring on Packham's Triumph, Beurré Bosc, and Howell.

This was a peak year for bacterial canker of apricot (*Pseudomonas syringae*) [cf. 33, p. 736]. Heavy infection by *Cladosporium carpophilum* [cf. 33, p. 612] occurred on apricots in coastal areas and East Kurrajong; thiram gave excellent control. It is believed that cherry leaf spot (*Coccomyces hiemalis*) [30, p. 216] has now been eradicated from the State. An epiphytotic of *Puccinia pruni-spinosae* [loc. cit.] occurred on prune plums at Young and severe infection in the Murrumbidgee Irrigation Areas.

The incidence of banana bunchy top virus [loc. cit.] continued to fall, 2,427 infected plants being found during the year. Losses from banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: 33, p. 209] were again heavy in the Tweed and Brunswick districts.

Plasmopara viticola [29, p. 143] occurred early on vine in coastal regions but was controlled by spraying. Late-maturing canes in some vineyards were heavily infected by *Uncinula necator* [cf. 29, p. 402]. Several hundred Rhine Riesling vines and one plant of Montils exhibited thickening and crinkling of the leaves, phloem necrosis, and shortening of the internodes, suggestive of a virus disease.

Olive leaf and fruit spot (*Cercospora cladosporioides*) [31, pp. 354, 500] was recorded for the first time in New South Wales, causing severe damage in two areas.

The mode of entry into Australia of *Puccinia antirrhini* [see above, p. 283] is not known, since uredospores found on imported antirrhinum seed [cf. 32, p. 316] have not reproduced the disease in experimental inoculations.

The total yield of certified bean [*Phaseolus vulgaris*] seed was 2,735 bush., Brown Beauty constituting 40·5 per cent. Fifty-two crops were rejected for certification because of anthracnose (*Colletotrichum lindemuthianum*) [33, p. 211].

New disease records for the year [33, p. 591] include *Erysiphe cichoracearum* [loc. cit.], *Pseudoperonospora cubensis*, and *C. lagenarium* on Zuica melon (*Lagenaria* sp.), *Cercospora apii* on celery, manganese deficiency of oats, *Phleospora crescentium* on parsnip, *Pseudomonas solanacearum* on eggplant, *Fusarium trichothecioides* on potato (1950 record), [tomato] spotted wilt virus on *Statice sinuata*, *Cymadothea trifolii* on red clover, [clover] mosaic virus on subterranean clover, *Armillaria mellea* on chestnut and Lombardy poplar, and *Phytophthora megasperma* on cauliflower, causing up to 100 per cent. infection in waterlogged ground and slight losses on higher ground.

Among the potato diseases black leg (*Bacterium carotovorum*) [*Erwinia carotovora*: 33, p. 377] caused severe losses of Sebago (50 to 90 per cent. infection), Sequoia, and, to a lesser extent, Monak, and was responsible for the rejection of 20 per cent. of the crops submitted for certification on the central tablelands. High resistance to *Actinomyces scabies* [33, p. 212] was shown in a field trial by the varieties Ontario, Menominee, and Seneca, and seedlings S2669 and S2680. Tableland crops were relatively free from potato leaf roll virus [loc. cit.], only 2·2 per cent. being rejected because of excessive infection on the central tablelands, 0·7 on the southern, and none on the northern.

A severe outbreak of tomato spotted wilt virus [32, p. 105], which in November entirely destroyed one crop of 3,000 tomato plants at Somersby and later caused heavy losses in surrounding areas, may have been due to the migration of *Thrips tabaci* from infected *Bidens pilosa*.

Petit (A.). **Sur les travaux de recherche effectués au laboratoire de cryptogamie du Service Botanique et Agronomique de Tunisie en 1952.** [Research work conducted in the cryptogamic laboratory of the Botanical and Agronomical Service, Tunis, during 1952.]—*C.R. Acad. Agric. Fr.*, 39, 7, pp. 389–390, 1953.

In this report of the work of the above laboratory during 1952 [cf. *R.A.M.*, 30, p. 460] it is stated that of 352 lines tested 92 soft and 32 hard wheats showed satisfactory or high resistance to rusts [*Puccinia* spp.].

Loose smut [*Ustilago tritici*: loc. cit.] in the hard wheat Oued-Zenati from Algeria was controlled effectively in the laboratory by soaking the seed for 60 minutes in water at 45° to 49° [C.] and for 16 minutes at 52° to 53° and air-drying. Smut incidence in 25,583 spikes was 0·5 per cent. in untreated and nil out of 26,464 in treated lots. The treatment of two Florence-Aurore lines in the La Manouba apparatus resulted in 3 out of 20,400 smutted spikes as against 134 out of 24,465 in the untreated controls. Steeping in lime-water in addition to normal steeping did not improve the degree of control.

Seed disinfection with copper salts, oxyquinoline sulphate, organo-mercurials, various organic compounds, and finely divided sulphur gave more or less complete control of wheat bunt [? *Tilletia foetida*: cf. 31, p. 108], barley covered smut [*Ustilago hordei*: loc. cit.], and loose smut of oats [*U. avenae*: 30, p. 461].

Rosenthal (S. A.) & Cox (C. D.). **An antigenic analysis of some plant and soil Corynebacteria.**—*Phytopathology*, 44, 10, pp. 603–604, 1954.

From the results of limited studies described in this joint contribution from the Pennsylvania State and South Dakota Universities, using agglutination and agglutinin-adsorption methods, *Corynebacterium poinsettiae* [*R.A.M.*, 31, p. 480],

C. flaccumfaciens, and *C. sepedonicum* appear each to comprise a serologically homogeneous species. *C. poinsettiae* and *C. flaccumfaciens* were serologically indistinguishable, whereas *C. sepedonicum* and *C. tumescens* (a soil organism) differ from each other as well as from the *C. poinsettiae-C. flaccumfaciens* group. All the foregoing species were found to be antigenically unrelated to *C. michiganense* and *C. insidiosum*.

Report of the International Wheat-Stem-Rust Conference, Winnipeg, Canada. January 5–7, 1953.—133 pp., 1953. [Mimeographed.]

This conference on wheat stem rust (*Puccinia graminis*) was opened by a brief review of the present status of the problem by E. C. Stakman, Helen Hart, and D. M. Stewart. The system of designating pathogenic races by their symptom expression on 12 standard differential varieties should be revised, following the development of many new wheat varieties constituting additional indicators, and the discovery of several different biotypes of race 15B [*R.A.M.*, 32, p. 672; 34, p. 218]. In 1952 15B comprised almost 60 per cent. of all uredial isolates in the United States, and races 56, 17, 38, and 19 together only 28 per cent.

T. Johnson reports on race distribution in Canada in 1951 and 1952 [32, p. 471; 33, p. 709]; 15B was more widely distributed in 1952, occurring in all provinces except Prince Edward Island, the greatest concentration being in Manitoba and Saskatchewan. Races 2 and 48 occurred in both years in south-eastern British Columbia and southern Alberta.

E. C. Stakman, Helen Hart, R. Postigo, and S. Goto describe how biotypes within races are distinguished at various temperatures and light intensities on a wide range of varieties of wheat, barley, and oats. Using the standard differential wheat varieties supplemented by ten additional ones 17 isolates of 15B were differentiated into eight biotypes; a further six were distinguished on 11 varieties of barley. Probably most races of stem rust comprise several biotypes.

N. E. Borlaug, I. Narvaez, and T. Enciso report that the rapid increase and spread of race 49 in Mexico further complicates the problem of developing resistant varieties [31, p. 482; 34, p. 217]. This race is highly pathogenic to many of the Kenya wheats, Egypt Na 101, McMurachy, and their derivatives. Hope, Timstein, Thatcher, Gabo, and the Brazilian varieties and their derivatives are resistant. Kenya 338 Ac. 2.E.2 is resistant to both 15B and 49.

The pathogenicity of races 11, 49, and 139 to the Kenya wheat varieties and their derivatives is described by E. B. Hayden, D. H. Smith, and E. C. Stakman. Kenya 58, Kenya 117 A, Lerma, and Kentana were heavily infected at 70° to 75° and 80° to 85° F. Races 11 and 49 occur only occasionally in the United States, and 139 has never been important, but they constitute a potential threat to new varieties being bred to resist 15B.

D. H. Smith and E. B. Hayden have found differences in pathogenicity among isolates of race 11; one of these and one of 32 were virulent on Khapli emmer (*Triticum dicoccum*) and lines with Khapli in their parentage, but less so than 15B.

Variability in rust reaction is surveyed by Helen Hart and E. C. Stakman. Over a temperature range reaction may be stable or completely changed [cf. 34, p. 28]; thus Ceres is infected with race 56 at 65° to 85° whereas some Kenya derivatives are resistant to races 56, 17, 38, and 15 at 72° but susceptible at 85°. A light intensity of 1000 to 3000 ft. candles favours chlorosis and necrosis in a resistant variety infected by *P. graminis*, and stimulates sporulation, whereas light of 100 to 200 ft. candles delays necrosis, favours vegetative growth of the rust and suppresses sporulation, and an even lower intensity may make a susceptible variety appear to be resistant. Occasional slight reductions in infection were observed when inoculated wheat was kept in a moist chamber for 48 hours instead of 24.

C. V. Lowther, T. Theis, and H. A. Rodenheiser summarize the reactions to stem rust at Saint Croix, Virgin Islands, Mexico, and Beltsville, Maryland [32, p. 672]. The most promising sources of resistance among durum wheats are Beladi 116 from Egypt, Tremez Molle, Tremez Preto, and Tremez Rijo from Portugal, and Chapinge from Canada. Nine introductions from Kenya showed outstanding resistance as did some of their hybrids with commercial wheats, some hybrids of Egypt Na 101, and a few selections of Frontana × Newhatch.

A brief note indicates a variable effect of temperature, according to variety, on wheat seedling reaction to race 15B investigated by J. G. Dickson at Wisconsin.

G. J. Green summarizes the results of greenhouse and field experiments on the effect of temperature on varietal reaction of wheat to stem rust. Varieties whose resistance breaks down at higher temperatures are of use only in areas where the critical limit is not, or very rarely, reached during the growing season; for example McMurachy showed excellent resistance at Winnipeg. Emphasis is laid on the importance of carrying out varietal tests under a wide range of environmental conditions.

The seedling reactions of wheat varieties to 22 cultures of race 15B are tabulated by T. Johnson. The following varieties were very resistant: Kenya C. 10857, K. 58F. (L.)1, K. 291.J.1.1.1, K. 337. V.1.B.1, K. 337. V.3.A.1, K. 350. AE. 4.A.1, and K. 350. C.2.B.2. Two strains, 15B-1 of common occurrence and the rather rare 15B-2, were distinguished by the reaction of Golden Ball. There was some evidence of the existence of biotypes differing in parasitic vigour rather than in host specialization. The same author gives the results of varietal tests of wheat and barley seedlings with 11 Canadian races of *P. graminis*, collected during 1951. McMurachy and Kenya R.L. 1373 were resistant to 15B and very resistant to the other races, while Kenya C. 10857, K. 58 F. (L.) 1, and K. 337 V.3.A.1 were very resistant to all eleven.

The distribution of physiologic races of leaf rust (*P. triticina*) in Canada [32, p. 471] in 1951 and 1952 is described by A. M. Brown. Race 58 is most prevalent in Ontario and the Maritime Provinces, 5a and 15a in the Prairie Provinces, and 1a and 11 in south-eastern British Columbia and southern Alberta. Exchange and Frontana are resistant to all these races, while Lee [loc. cit.] is moderately susceptible to race 11 in the seedling stage.

C. O. Johnston surveys the prevalence and distribution of leaf rust races in the hard red wheat growing areas of the United States. Experimental evidence indicates that some so-called physiologic races may be ecotypes. Definite biotypes of races 9, 5, 15, and 105 have been demonstrated.

Describing the prevalence, distribution, and pathogenicity of wheat leaf rust races in the upper mid-west region of the United States, M. N. Levine states that there has been little change in race composition. In 1950–2 the most common races were 15 (17·5 per cent.), 5 (15·8), 52 (15·2), 2 (9·5), and 126 (5·7). Biotypes of races 5, 6, 11, 16, 28, and 126 have been distinguished by their reactions on Lee seedlings.

In further work on the sources of resistance to leaf rust [31, p. 10] M. N. Levine notes isolated cases of breakdown in resistance of promising varieties, such as Lee showing 27 per cent. infection in Illinois in 1951.

R. M. Caldwell and J. F. Schafer review the current status of wheat leaf rust in Indiana. *P. triticina* has not overwintered extensively in this area for the past ten years, and the resistance of Vigo is still high, possibly because of the absence of this type of resistance from the inoculum source area.

The wheat varieties resistant to leaf rust at Winnipeg [32, p. 471] in 1951 and 1952 are listed by A. M. Brown. The high resistance of Frontana, Frondoso, and Surpresa has been transferred successfully to many hybrids.

H. C. Young, D. F. Wadsworth, and A. M. Schlehuber contribute observations

on leaf rust isolations in Oklahoma [33, p. 715], and give an analytical key for race identification on differential wheat varieties.

From the results of plot tests by B. PETURSON losses caused by leaf and stem rust in Manitoba in 1952 were estimated at 5 per cent. of the total yield in the variety Lee [32, p. 471] and 15 per cent. in Redman and Thatcher. L. R. WALDRON reports on breeding for resistance to 15B using Lee and sibs of Mida [32, p. 369]. The results obtained indicate that unexpectedly satisfactory selections may be made from parents which do not at first seem suitable.

Progress in breeding for resistance to 15B at the North Dakota Agricultural College Experiment Station is described by G. S. SMITH. The most promising parent is Kenya 338, from which resistance is inherited as a dominant character.

E. G. SHANDS estimates that in 1952 stem rust reduced the yield of spring wheat in Wisconsin by 1·5 per cent., and of winter wheat by 0·5 per cent. The most promising F_2 hybrid spring wheat selected for resistance is ((Henry–W38–Hope) × Thatcher–Surpresa) × Kenya C.I. 12880. In winter wheat the main sources of resistance to stem rust are Hope and *Triticium timopheevi* [34, p. 27], and to leaf rust, Blackhawk, Shansi C.I. 12612, D 44 9, and Hope–Hussar C.I. 11682.

Progress in breeding for stem and leaf rust resistance in Minnesota [32, p. 672; 33, pp. 416, 663] is reviewed by E. R. AUSEMUS, D. W. SUNDERMAN, K. J. HSU, and D. H. SMITH and similar work at the Dominion Laboratory of Cereal Breeding, Winnipeg, by A. B. CAMPBELL. B. C. JENKINS gives an account of breeding for rust resistance at the University of Saskatchewan [31, p. 482].

Wheat improvement in South Dakota is described by V. A. DIRKS. In searching for stem rust resistance varieties are used which possess a high degree of tolerance to *P. graminis*. Surpresa is the chief source of resistance to *P. triticina*.

Work in Mexico on sources of resistance to stem rust races 49 and 15B is summarized by A. CAMPOS, E. DUARTE, and M. ROJAS [see above, p. 286]. The reactions of 83 lines to races 49, 15B, 56, and ? 125 are tabulated. Egypt Na 95 is very resistant to 49 and virtually all the hard red spring wheats and durum varieties are resistant.

Bread wheat varieties which were resistant in field and greenhouse tests in 1952 to races 15B and 49 of *P. graminis* in the Latin American Rust Nursery, Mexico, are listed by J. W. GIBLER, A. ACOSTA, and G. VAZQUEZ. They are Kenya 338 Ac. 2E. 2, Kenya B 286, Kenya 184. P.2.A.1.F, Kenya 360 H, P.I. 170904, P.I. 170905, P.I. 170910, P.I. 170914, P.I. 170925, P.I. 189812, and Veadeiro. Resistant durum wheats and varieties of *T. dicoccum* and *T. turgidum* are Khapli, Caravaca No. 1, Rojal de Alicante, Rojal de Almeria, St. 464 Ethiopia, Sernai Caieb, Camadi Abdu tipo 103, Amarai Blanco tipo 142, C.I. 7261–15, C.I. 7501, C.I. 7859, C.I. 8131, Beladi 116 P.I. 133457–2c, and the lines of Golden Ball–Iumillo–Mindum RL Nos. 1714, 1714–1c, 1714–2c, and 1714–3c.

J. A. RUPERT reports on breeding for rust resistance in Colombia [33, p. 281]. Three lines of Mentana 2–Kenya C 9906, which combine good agronomic qualities with resistance to stripe rust (*P. glumarum*) [loc. cit.] and 15B race of stem rust, are being increased.

Progress in breeding hard red winter wheats for resistance to rust in Kansas [33, p. 472] is described by C. O. JOHNSTON, E. G. HEYNE, J. W. SCHMIDT, and W. C. HASKETT. The best crosses producing lines resistant to 15B are Oro–Med.–Hope × Kenya R.L. 1373, Kenya R.L. 1373 × Marquillo–Oro, Kenya R.L. 1373 × Hope–Turkey, and Med.–Hope–Tenmarq × McMurachy; promising results have also been obtained with wheat × *Agropyron* crosses.

R. M. CALDWELL, L. E. COMPTON, J. F. SCHAFER, and F. L. PATTERSON describe the programme at Purdue, Indiana, for breeding for leaf and stem rust resistance in soft red winter wheats.

The production of spring wheat for commercial use in Nebraska and for use in

breeding improved varieties of hard red winter wheat is discussed by L. P. Reitz and V. A. Johnson. Satisfactory yields and high resistance to *P. graminis* and *P. triticina* were obtained in 1952 from Timstein × Mida (C.I. 13027), Rushmore × Surpresa (C.I. 12972 and 12973), McMurachy–Exchange–Redman (C.I. 12953), and Thatcher × Surpresa (C.I. 12641). In many crosses of Kenya with winter wheats a semi-lethal type of physiological incompatibility was observed, which may be connected with greenhouse conditions.

Progress in breeding winter wheat varieties for Texas conditions [33, p. 663] is reviewed by I. M. Atkins and E. S. McFadden. Two hard red winter wheats, ((Sinvalocho × Wichita) × Hope–Cheyenne) × Wichita, C.I. 11702 and 11703, are resistant to the prevalent races of leaf and stem rust but not to 15B. Comanche × Red Egyptian and Clarkan × Red Egyptian show some promise against 15B.

A. M. Schlehuber and H. C. Young describe progress in Oklahoma in breeding *Agropyron*-wheat hybrids for leaf rust resistance [32, p. 672]. One cross, *Triticum* sp. × *A. elongatum* Ks. 464708, has shown good seedling resistance and adult immunity or high resistance to individual races of *P. triticina*.

J. E. Andrews reports on the breeding of winter wheats for leaf rust resistance in southern Alberta, where resistance to *P. triticina* is more desirable than resistance to *P. graminis* [32, p. 471]. The distribution of cereal rust physiologic races differs from that in the rest of Canada but is similar to that in south-eastern British Columbia [see above, p. 287]. The selection Purdue 3369–61–1–4–1–2–2–1 of Wabash × American Banner, and some wheat × *Agropyron elongatum* lines are sources of resistance.

R. H. Heermann describes the breeding of durum wheats for stem rust resistance [in North Dakota]. Ld. 356, a selection from Ld. 308 × Nugget, is being increased for use as a stop-gap variety as it is resistant to 15B which has caused great havoc among durum varieties. In co-operative tests in Canada and the United States of durum varieties from the World Collection some Abyssinian introductions showed promise against 15B.

Further work on the same lines in Winnipeg is discussed by A. B. Masson. The durum R.L. 1714 from the cross Golden Ball × (Iumillo Mindum R.L. 1317) was available as a source of resistance to 15B; however, a culture of this race has been found to which Golden Ball is susceptible. The transfer of McMurachy resistance to durum wheats is being attempted.

R. C. McGinnis, from Winnipeg, describes species building in wheat and wheat relatives for rust resistance. Species of *Aegilops*, *Agropyron* [34, p. 142], and *Haynaldia* are crossed with tetraploid wheats. Some hybrids with *Aegilops ovata*, *A. caudata*, *A. speltoides*, and *Agropyron obtusiusculum* possess good resistance to all *P. graminis* races tested and to most of *P. triticina*.

J. Unrau gives a brief progress report of work with aneuploids, chromosome substitutions, and species building at the University of Alberta. The reactions of some amphiploids are unexpected; for example, *T. timopheevi* × *Aegilops squarrosa* is highly susceptible to *P. graminis* although the parents are both resistant.

The genetic analysis of rust resistance being carried out in Minnesota is described by C. R. Burnham, R. L. Livers, L. Inman, J. Longwell, J. Miller, E. Clark, E. Turcotte, and E. R. Ausemus. The factor for resistance to *P. graminis* 56 has been located on chromosome VI in Frontana.

Similar studies at the University of Saskatchewan are reported by L. H. Shebeski. The varieties K 117 A, Gabo, Lee, Red Egyptian, Timstein, Egypt Na 95, Thatcher, and Marquis are being intercrossed to determine the number of gene loci involved in stem rust resistance in bread wheats.

D. R. Knott discusses problems attached to work at the same University on the transfer of rust resistance to high quality bread wheats from other varieties and

species, and the effect of genes for rust resistance on quality. The wheat-*Agropyron* derivative previously reported [31, p. 482] has stabilized with 2 $n = 56$, but hybrids with wheat are fertile. The dominant resistance of this line is being transferred to five wheat varieties of different qualities.

The location in specific chromosomes of genes responsible for rust resistance in several varieties is tabulated by B. C. Jenkins; for instance, Red Egyptian has two resistance genes on chromosomes VI and XX and Hope one on VIII. The method of location is briefly described.

C. A. Suneson reviews rust research work at Davis, California [33, p. 472]. Uredospores of stem rust are persistent all the year round in the State; wheat is grown on only nine per cent. of agricultural land; and the only stem rust races known are 11, 17, and 56. Resistance in the breeding programme is derived from four completely different sources and it is hoped that this will supply protection from possible new races that may be introduced.

Genetic and cytogenetic research on wheat at the Kansas State College is described by J. W. Schmidt, E. G. Heyne, Elizabeth McCracken, C. O. Johnston, and W. C. Haskett [33, p. 472].

E. R. Sears describes studies on genes in wheat and related species. Timstein has two genes for stem rust resistance on chromosome X, Red Egyptian one on XX and one or two on VI, Hope one on VIII and another as yet unlocated, and Thatcher one on XIX and one unlocated. Attempts are being made to combine resistance genes from different varieties and to transfer resistance from *Aegilops umbellata* to wheat.

J. E. Livingston reports on the control of stem and leaf rust with calcium sulphamate [33, p. 341]. Acting primarily as an eradicant it should be used in epiphytotics after the appearance of infection. Field studies at St. Paul, Minnesota, reviewed by M. N. Levine. indicated that the control of wheat rust epiphytotics with fungicides is not economically practicable.

C. H. Goulden contributes observations on wheat breeding in South America [31, p. 371; 32, p. 73; 33, p. 663, *et passim*].

Klein (E.). **35 años de trabajos de cruzamientos de combinación en Trigo.** [35 years of experiments in the hybridization of Wheat.]—*Arch. fitotéc. Urug.*, 5, 3, pp. 345–372, 2 diags., 1 graph, 1954.

Included in this comprehensive survey of the experiments in wheat breeding which have been in progress in Argentina [cf. next abstract] since 1915 are references to important developments in varietal selection for resistance to *Puccinia triticina*, *P. glumarum*, *P. graminis* [*R.A.M.*, 33, p. 220], and *Ustilago tritici* [30, p. 514].

Ribeiro (R.). **Evolución varietal del Trigo en el Uruguay.** [Varietal development of Wheat in Uruguay.]—*Arch. fitotéc. Urug.*, 5, 3, pp. 373–391, 4 graphs, 1954.

This history of the development of wheat varieties in Uruguay since the inception of breeding operations in 1912 includes references to past and present work on selection for resistance to *Puccinia graminis*, *P. glumarum* [C.M.I. map No. 97], *P. triticina* [*R.A.M.*, 31, p. 10], *Ustilago tritici* [cf. preceding abstract], and *Septoria nodorum*.

In current experiments at La Estanzuela, DP 1 (31) 3 (Río Negro × Litoral Precoz) and DQ 3 (150) 2 (Klein 157 × Litoral Precoz) have given evidence of resistance to various physiologic races of *P. triticina* and *P. graminis*, as well as to *U. tritici*. All the new varieties are more or less susceptible to the last-named, Frontana alone possessing a measure of resistance. Chino 166 and Riccio are being utilized as sources of resistance to *P. glumarum*.

Guyot (L.) & Massenot (M.). **À propos de la race 40 de Puccinia graminis tritici (rouille noire du Blé).** [Concerning race 40 of *Puccinia graminis tritici* (black rust of Wheat).]—*C.R. Acad. Agric. Fr.*, 39, 10, pp. 499–501, 1953.

Samples of black rust (*Puccinia graminis tritici*) on the wheat varieties GN and Cheyenne received from Montpellier in 1951 were found to belong to race 40 [*R.A.M.*, 33, p. 415] not hitherto recorded in France. Of various differential varieties from North America Einkorn showed marked resistance and Reliance and Vernal marked susceptibility. The reputed virulence of this race was confirmed by evaluating for each race of *P. g. tritici* encountered in France during the past few years the percentage of severe attacks (> Montpellier rating II) occurring on ten varieties differing in their reactions. Race 40 headed the list with 83·6 per cent., the lowest being race 14 with 16·4 per cent. A similar test of 42 popular varieties showed 35 to be susceptible to race 40. Of 267 varieties inoculated in the greenhouse during 1951 and 1952, 235 were highly susceptible or susceptible. Gabo, Hope × Timstein RL 2325, and Rojo de Humanes appeared to be highly resistant and Thatcher immune.

Fuchs (W. H.) & Rohringer (R.). **Biochemische Veränderungen im Weizenblatt durch Infektion mit Puccinia graminis tritici.** [Biochemical changes in the Wheat leaf through infection with *Puccinia graminis tritici*.] – *Naturwissenschaften*, 42, 1, p. 20, 1955.

At the Institute for Plant Pathology and Plant Protection, Göttingen, Germany, the biochemical changes induced in the leaves of Marquis and Vernal wheat seedlings by inoculation with physiologic race 126A of *Puccinia graminis tritici* were studied by means of paper chromatography of the purified extract, obtained seven days later. The chromatograms revealed both known and unidentified representatives of the polyphenol derivatives and amino compounds. No differences could be discerned between the two wheat varieties, which react differently to the rust, or between infected and uninfected plants in respect of the polyphenol derivatives, but a large number of ninhydrin-positive substances, including histidine, leucine, with or without isoleucine and asparagine, disappeared uniformly from both varieties as a result of inoculation.

Shoemaker (R. A.) & Tyler (L. J.). **Cercosporella foot rot of winter Wheat in New York.**—*Plant Dis. Reptr*, 38, 10, p. 710, 1954. [Multilithed.]

Cercosporella herpotrichoides was isolated from Cornell 595 winter wheat [C.M.I. map No. 74] in Tompkins county, New York, in 1953 and reported from 25 counties in the State in 1954. A Cornell Herbarium specimen of diseased wheat, collected in 1944 and labelled *Rhizoctonia* [*Corticium*] *solani*, was found to bear stromata characteristic of *Cercosporella herpotrichoides* and appears to be the earliest New York collection of the fungus on wheat.

Linford (M. B.) & McKinney (H. H.). **Occurrence of Polymyxa graminis in roots of small grains in the United States.**—*Plant Dis. Reptr*, 38, 10, pp. 711–713, 1 fig., 1954. [Multilithed.]

Examination of wheat roots at Illinois Agricultural Experiment Station revealed that *Polymyxa graminis* [*R.A.M.*, 18, p. 449] is widespread in fields infested with the soil-borne wheat mosaic virus [33, p. 418] in Illinois and other States and may occur in virus-free wheat fields. The fungus developed well in pot cultures of wheat and spelt growing in sand or soil at temperatures between 60° and 65° F. There is no evidence that *P. graminis* can function as a virus vector or as a reservoir host.

MEINERS (J. P.) & MCKINNEY (H. H.). **Wheat streak mosaic found in Washington.** —*Plant Dis. Reptr*, 38, 10, pp. 714–715, 1954. [Multilithed.]

Wheat streak mosaic virus [*R.A.M.*, 34, p. 89], not previously reported from the Pacific Northwest, caused severe infection in 1954 in the wheat-breeding nurseries of the Washington Agricultural Experiment Stations at Pullman. In greenhouse experiments at Beltsville, Maryland, using inoculum from the diseased wheat leaves, Michigan Amber wheat, *Digitaria ischaemum*, and Golden Giant maize developed systemic symptoms four to eight, seven to nine, and seven to 18 days, respectively, after inoculation.

Barley false stripe virus [33, p. 532] was observed at Pullman in an adjacent barley nursery and inoculated wheat plants developed stripe symptoms within ten days. Neither disease, however, was noticed in commercial fields in the Pullman area.

NOLL (A.). **Histologische Untersuchungen über den Rostbefall verschieden anfälliger Getreidesorten, mit besonderer Berücksichtigung von Puccinia simplex auf Gersten.** [Histological studies on rust infection of cereal varieties of differing susceptibility, with special consideration of *Puccinia simplex* on Barleys.]—*Zbl. Bakt.*, Abt. 2, 108, 8–12, pp. 282–311, 9 figs., 1954.

In greenhouse experiments at the Biological Institute, Brunswick, the frequency of stomatal infection by *Puccinia simplex* [*P. hordei*] on barley [cf. *R.A.M.*, 23, p. 58; 29, p. 296] was correlated solely with the quantity of spore inoculum applied and not with the degree of varietal resistance. The latter factor, however, was concerned in the further development of the mycelium, which also depended in the highly susceptible Streng's Domina variety on the distribution of the inoculation sites; only when these were widely spaced did the area invaded by hyphae reach a diameter of up to 4 mm. In the semi-resistant Australian Recka the mycelium was either poorly developed from the outset or it started on an equal footing with that on the susceptible variety and then deteriorated. The highly resistant Quinn was seldom penetrated and then only for a short distance, while in the incompatible Michigan Amber wheat the rust did not pass beyond the stoma. The author describes in detail the histological changes associated with chlorosis, necrosis, and eventual death of invaded tissues of both susceptible and resistant varieties.

Most of the symptoms of rust infection could be induced by various natural causes or experimental treatment with heavy metal salts. However, the acute necroses resulting from the intensive operation of such factors presented no analogy with the dying-off associated with rust resistance.

The paper contains some incidental references to *P. graminis*, *P. glumarum*, and *P. triticina* on wheat and *P. coronata* on oats, which are also under investigation at the Biological Institute. Particular attention, however, was paid in this instance to *P. hordei*, partly by reason of the relative paucity of studies on its histology and more especially because infection and the further course of the disease are comparatively independent of external factors [cf. 18, p. 666].

HECHT (W.). **Zur Frage der Ausbreitung von Mutterkorn-Infektionen.** [On the question of the spread of ergot infections.]—*Bodenkultur*, 7, 4, pp. 363–371, 4 figs., 1953.

In field experiments in Austria the spread of ergot [*Claviceps purpurea*: *R.A.M.*, 34, p. 224] infections produced by artificial inoculation of rye ears is accomplished in the immediate vicinity by contact and insects; at a distance of up to 1 km. by the latter alone. On an average, insects are concerned to the extent of only 10 and 5 per cent., respectively, in the short- and long-distance dissemination of the honeydew (*Sphacelia*) conidia. Mention is made of the culture in 1949 of ivory-coloured

('leuco') sclerotia with a lower alkaloid content than the normal purplish-black ones [loc. cit.].

Perišić (M.). **Le charbon du Seigle.** [Smut of Rye.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1953*, 19, p. 110, 1953.

Rye loose smut (*Ustilago tritici*) [cf. *R.A.M.*, 5, p. 733], hitherto unrecorded in Yugoslavia, was observed there by the author in May, 1952.

Rowell (J. B.) & DeVay (J. E.). **Genetics of Ustilago zeae in relation to basic problems of its pathogenicity.**—*Phytopathology*, 44, 7, pp. 356–362, 4 figs., 1954.

In this paper presented at the Symposium on Genetics of Phytopathogenic Fungi in Relation to Basic Problems of Infectious Disease at Madison, Wisconsin, on 7th September, 1953, the authors observe that *Ustilago zeae* [*U. maydis*: see next abstract] possesses unique advantages for genetic investigations of the mechanisms of parasitism and pathogenicity among the smut fungi.

Various aspects of the interrelationships of sex, parasitism, and pathogenicity in *U. maydis* have been studied with biotypes obtained by mutation and hybridization. Mutants in pathogenicity were found which exceeded the parent in virulence, and others which had lost pathogenic compatibility. The existence of multiple sex groups has been confirmed by a study of the inheritance of factors governing sexual compatibility. A unique pathogenic relationship was found in pairings between certain lines of *U. maydis* and *Sphacelotheca reiliana* that caused gall and chlamydospore formation in inoculated maize. There was no evidence of hybridization between the two lines since the chlamydospores and their monosporidial progenies through two 'generations' resembled *U. maydis* in all characteristics. That a part of the maize smut disease syndrome was independent of dikaryon formation was indicated by the marked increase in pathogenicity of certain haploid lines when inoculated maize was given supplementary injections of the cell-free culture filtrates from a second compatible line.

Of the 27 contributions to the literature cited by the authors, many have already been noticed in this *Review*.

DeVay (J. E.). **Amino-acid composition of monosporidial cultures of Ustilago zeae of different sex.**—*Phytopathology*, 44, 10, pp. 583–587, 3 figs., 1954.

The results of the author's studies at the University of Minnesota on the biochemistry of monosporidial cultures of *Ustilago zeae* [*U. maydis*: see preceding abstract] have already been noticed in part from another source [*R.A.M.*, 33, p. 439]. No marked disparities were found in the bound (as distinct from the free) amino acid content of lines of different sex. There appears to be no relationship between the bound and free amino acids synthesized in pure culture by lines of *U. maydis* and their sex and pathogenicity.

Koehler (B.). **Some conditions influencing the results from Corn seed treatment tests.**—*Phytopathology*, 44, 10, pp. 575–583, 2 figs., 1 graph, 1954.

Information is presented from the Illinois Agricultural Experiment Station on some factors affecting damage from seedling diseases in maize. Of great importance is the prevalence of broken places in the pericarp [*R.A.M.*, 14, p. 355]. *Pythium debaryanum*, for instance, could be isolated from the scutellar area of some seeds with broken pericarps only three days after planting in moist field soil at 50° F. Pericarp injuries were found in some 81 per cent. of commercially processed seed, many of the broken places being detectable only by stirring the sample for 30 seconds in a 0·1 per cent. aqueous solution of fast green followed by washing in several changes of water and drying. In a three-year field test processed seed, seed with pericarps partially removed from the crown, and immature seed responded

significantly to seed treatment with arasan SF, spergon DDT-SL and phygon XL–DDT all at ½ or 1 oz. per bush. Genetic constitution and age of the seed are also important in relation to susceptibility to seedling blight and reaction to treatment. Thus, the hybrids widely grown in the Corn Belt, e.g., Indiana WF9, Kansas K4 and Ohio 07, are highly susceptible to disease when injured seed is planted without treatment. In general, the efficacy of treatment increases with advancing age of the seed.

In controlled low-temperature tests, using a 'walk-in' refrigerator maintained at 50° and dark silt loam prairie soil [cf. 31, p. 61], conditions were rendered sufficiently adverse for the development of substantial loss even in seed with sound pericarps unprotected by a suitable fungicide. For instance, stands of untreated seed with sound pericarps after 20 days in a cold chamber were roughly equivalent to those produced by untreated seed with broken pericarps kept at 50° for just under four days. In cold tests, stand counts alone usually served as a criterion for the determination of seed treatment efficiency, since differences in stand were closely correlated with variations in vigour. This rule did not apply, however, when germination was retarded by low moisture rather than low temperature. In field trials, stand differences due to treatment were generally closely correlated with yields.

In field tests on seed with sound pericarps, treatment with arasan SF, spergon DDT-SL, and U.S. No. 5400 (at ½, 1, and 2 oz. per bush.) led to no increase in stand; but when the same kind of seed was planted in similar soil and placed in a cold chamber for 20 days, treatment resulted in striking increases in stand. On the other hand, when seed with the pericarp partly removed from the crown was similarly treated and used for both field and cold tests, there was a highly significant correlation in stand of 0·657 between the two kinds of test.

Soil sufficiently dry to delay seed germination was shown to be conducive to an increase in seedling disease, expressed chiefly in loss of vigour. A species of *Trichoderma* and an unidentified fungus were isolated on the fifth day from nearly all the kernels of seed planted in soil with 10 per cent. moisture.

From 1949 to 1953 the amount of internal infection in processed, untreated seed was assessed on 200 surface-sterilized seeds from each of 50 samples. The percentages of *Diplodia zeae* and *Gibberella zeae* thus obtained corresponded closely to those given by other methods not involving surface sterilization. On the other hand, most of the infection caused by *F. moniliforme* [*G. fujikuroi*], *Cephalosporium acremonium* and *Penicillium* sp. is more superficial, and it is thought that a moist-moisture technique of testing the prevalence of diseased kernels would have given considerably higher figures. The averages in these tests for *D. zeae*, *G. zeae*, *G. fujikuroi*, *C. acremonium*, *Nigrospora oryzae*, and *P.* sp. were 0·78, 0·14, 6·4, 4·8, 1·7, and 0·94 per cent., respectively.

SAUVAS (A. M.). **Les champignons parasites des Sorghos (Sorghum vulgare) et des Pénicillaires (Pennisetum typhoideum) en Afrique Équatoriale Française (fin).** [The parasitic fungi of Sorghums (*Sorghum vulgare*) and Millets (*Pennisetum typhoideum*) in French Equatorial Africa (conclusion).]—*Agron. trop. Nogent.* 9, 6, pp. 647–686, 12 figs. 1954. [English and Spanish summaries.]

In this final contribution [*R.A.M.*, 33, p. 566] 11 fungi are described, including one new species. Charcoal rot (*Macrophomina phaseoli*) [cf. 11, pp. 104, 500; 33, p. 150, et passim] in Tchad attacks sorghum in circular patches in localities where the crop grows under unfavourable conditions, especially on the dry plateaux between Léré and Pala and in the very wet areas near Logone (Moundou), but does not cause important losses. Covered smut (*Sphacelotheca sorghi*) [32, p. 90] is the most damaging and the most widespread of the smuts observed on cultivated sorghum in Tchad and Ubangui-Chari. Incidence varies from 5 to 20 per cent. in

Tchad and the north-east of Ubangui and may be more than 50 per cent. in the more humid areas of Lobaye. The disease is particularly well developed on *Sorghum guineense*, the cultivation of which is confined locally to the district of Fianga (Mayo-Kebbi). It is present also on early red- and white-seeded varieties of *S. caudatum*, but is less severe on these than is *S. cruenta*. In the south-west and centre of Tchad *S. sorghi* was present to some extent in every region on *S. guineense*, *S. caudatum*, *S. membranaceum*, *S. notabile*, and other species.

Loose kernel smut (*Sphacelotheca cruenta*) [loc. cit.] is present to some extent everywhere in the area between Middle Chari and Tchad, and in some other localities. The collection of sorghum varieties at Ba-Illi Station was also attacked in 1952. In Ubangui-Chari the disease is common in the north and east, but it is not present in the forest zone of Lobaye, though *S. sorghi* causes severe damage in this area. In general, the fungus attacks all varieties of common sorghum, *Sorghum saccharatum*, and *S. halepense*, and is especially severe on late varieties of *S. caudatum* cultivated in the wet season.

Head smut (*Sphacelotheca reiliana*) [C.M.I. map No. 69] was found in Tchad in late-sown crops only, especially in the regions of Mayo-Kebbi, Logone, and Middle Chari. The information supplied locally indicated that the fungus is less common in these areas than *S. cruenta* and *S. sorghi*.

Phyllosticta penicillariae causes severe infection of millet leaves in every planting in Tchad, being found throughout the entire south-western zone, as well as in some central areas. Infection is more intense in Logone and Middle Chari and less so in Mayo-Kebbi. In the few fields of this crop in Ubangui-Chari the attacks are as severe as they are in Tchad. It is recommended that all millet débris be burnt and rotation practised.

A species of *Placosphaeria* (? the imperfect form of *Phyllachora pennisetti* [*R.A.M.*, 29, p. 123]) is common on the leaves and sheaths of millet in Tchad. Attacks usually occur as the grain is approaching maturity, though only slightly affecting yields, unless infection occurs before earing or while the grain is still in the milk stage, when there is a reduction. Sometimes many ears are sterile. The fungus produces numerous, isolated or confluent, pustule-like, elongated or oval, shining black, crusted spots 2 to 3 mm. long on both surfaces of the leaves. The lowest leaves are attacked first, then the fungus spreads upwards until the whole plant is involved. The fungus has unicellular, colourless, oval to subcylindrical spores with obtuse ends measuring 8 to 12 by 2·5 to 3·5 μ.

Puccinia penniseti [cf. 33, p. 758] is widespread on *Pennisetum typhoides* in Tchad: it was found at the Ba-Illi Station and in almost every planting in the south-west zone, and was very severe, when infection was early, in parts of Logone, Mayo-Kebbi, and Middle Chari. Green ear (*Sclerospora graminicola*) [32, p. 90] affects *P. typhoides* in the south-west zone and at Ba-Illi Station. Infection varies from 3 to 10 per cent.

In Tchad *P. typhoides* is seriously affected by a species of *Sphaceliа* [cf. 11, p. 97], each ear bearing 10 to 80 arcuate, ergot-like sclerotia. Diseased ears are sometimes affected by covered smut (*Tolyposporium penicillariae*) [cf. 33, p. 758] also. Losses in 1952 were estimated to average 5 per cent. in Tchad as a whole, though in some plantations the figure was over 10 per cent. *T. penicillariae* is widespread in almost every planting of *P. typhoides* in Tchad. Locally, the disease is endemic and losses average 10 per cent., but in certain plantations may reach 15 per cent.

For the important diseases control methods are reviewed and suitable ones recommended. A list of 265 references is appended.

LEVITT (E. C.). **Citrus improvement and a Citrus parent tree registration scheme.**—*Agric. Gaz. N.S.W.*, 64, 4, pp. 184–187, 8 figs., 1953.

In an attempt to eliminate bud-transmissible citrus virus diseases, including scaly

butt [see above, p. 284] and psorosis [*R.A.M.*, 34, p. 33], and to provide sufficient virus-free buds for the increasing demand, the Citrus Bud Selection Co-operative Society of New South Wales has inaugurated a Parent Tree Registration Scheme [cf. 27, p. 128]. Nominated trees, which must be ten years old or over, are examined regularly over a period of three years, together with all trees within a radius of 44 ft., before registration certificates are granted.

Busby ([J.] N.). **La tristeza en Floride.** [Tristeza in Florida.]—*Fruits Prim. Afr. N.*, 23, 250, p. 369, 1953.

In this French abstract (by J. de Bienkewicz) of a paper published in *Citrus Indust.*, 34, 8, pp. 5–7, 1953, it is stated that tristeza disease is present in all citrus-growing sections of Florida [*R.A.M.*, 32, p. 677 ; 34, p. 91], but assumes a mild form and gives no cause for alarm. It appears to have been present for 15 to 20 years.

Alba Robayo (V.). **La 'tristeza' de los Citrus, grave amenaza para la industria citrica.** [Citrus tristeza, a grave menace to the Citrus industry.]—*Agricultura trop.*, 9, 3, pp. 41–45, 1 fig., 1953.

The author reviews, with the aid of the literature, the nomenclature, history, distribution, varietal reaction to, symptoms, economic importance, cause, and control of citrus tristeza or quick decline [*R.A.M.*, 33, p. 24] and discusses the means at hand of preventing its introduction into Colombia, which boasts a growing citrus industry. The best method appears to be the development and use of resistant varieties and hybrids, particularly as stocks. At the Agricultural Experiment Station, Palmira, susceptible sour orange stocks are already being replaced by rough lemons [loc. cit.].

Bitters (W. P.). **Stem pitting on Citrus trees.**—*Calif. Agric.*, 7, 1, pp. 9, 14, 4 figs., 1953.

This information on citrus stem pitting [*R.A.M.*, 32, p. 621] in California has already been noticed from another source [32, p. 428].

Brun (J.). **La fonte des semis de Bigaradier (Sclerotinia sp.).** [Damping-off of Seville Orange seedlings (*Sclerotinia* sp.).]—*Fruits d'outre-mer*, 8, 3, pp. 118–119, 1 fig., 1953.

Seville orange seedlings growing at the Central Station, Institute for Colonial Fruits and Citrus, Foulaya, [French] Guinea, were attacked by a fungus probably identical with *Sclerotinia sclerotiorum* [*R.A.M.*, 24, p. 500] but differing in its unusual mode of attack. The wood and cortical tissues were completely destroyed and the fibres disintegrated at the collar. Instead of entering at the buds as is usual in the case of stem attacks the organism gained entry at soil level.

The leaves of four-month-old seedlings turn yellow, then brown, curl up, and finally fall. The terminal bud may still produce one or two leaves with similar symptoms. Young plants uprooted at the commencement of yellowing have a mycelial sheath containing soil particles enclosing the collar, the cortical tissues of which are greyish and spongy. At the final stage of the disease when the seedling has withered completely the sheath falls away leaving the wood exposed. The presence of sclerotia was sporadic.

The hyaline or slightly yellowish, irregularly septate mycelium measured 1 to 3 μ in width. The sclerotia on the host varied from 1 to 4 to 5 mm. and from dirty white to black, but on Czapek's agar they were uniformly 1 to 1·5 mm. and reddish-brown. In the absence of apothecia the fungus is provisionally identified as *Sclerotinia* sp. The disease was favoured by the damp conditions prevailing in low-lying beds at the commencement of the rains. More than 50 per cent. of the seedlings were destroyed.

Control comprises transplanting in fresh soil after dipping the seedlings in a 1 in 1,000 orthoxyquinoline solution, provided they are 20 to 30 cm. high and sturdy. Weak seedlings develop abnormally after treatment and are probably better destroyed. Deep disinfection of the beds before sowing with 1 per cent. commercial formalin or surface treatment with a 5 or 10 per cent. solution is advisable.

Mijukšović (M.). **Neke bolesti i štetočine Agruma na crnogorskom primorju.** [Some diseases and pests of Citrus on the Montenegrin coast.] —*Zasht. Bilja [Plant Prot., Beograd], 1953*, 19, pp. 47–60, 1 pl., 4 figs., 1953. [French summary.]

Of the citrus diseases occurring along the coast of Montenegro in Yugoslavia, gummosis (*Phytophthora* spp.) [cf. *R.A.M.*, 32, p. 621] is the most important. Grafting on sour orange and *Poncirus trifoliata* is increasingly reducing the danger from this disease. Anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: cf. 33, pp. 670, 720] is frequently observed on trees weakened by unfavourable climatic conditions or by other diseases and insects. *Phytomonas* [*Pseudomonas*] *syringae* [32, p. 636] is very widespread but does not cause serious damage. Root rots due to *Armillaria mellea* [32, p. 175] and *Rosellinia necatrix* [7, p. 557] are only rarely observed and usually on trees in poor condition. Serious rotting of fruit is caused by *Botrytis cinerea* [32, p. 555], *Alternaria* sp., *Penicillium digitatum* [32, p. 480], *P. italicum* [loc. cit.], and *Cladosporium* sp. The widespread infection by these fungi is largely due to improper picking. *Fusarium* sp. caused considerable damage in nurseries at Hercegnovi in 1950 and 1952.

Two virus diseases of citrus have so far been observed in Yugoslavia: concentric ring blotch [29, p. 89] and an unspecified virus characterized by leaf chlorosis reminiscent of 'panachure', but differing from it in that the lines are parallel and have well delimited borders. Leaves on trees affected by this virus are deformed, becoming long and narrow or else almost circular, stunted, and wavy. Often the top of the trees or parts of it appear bushy. This symptom is particularly severe on sour oranges. Yields from affected trees are reduced.

Long (J. K.). **Mould wastage in Oranges can be controlled successfully.**—*Agric. Gaz. N.S.W.*, 64, 9, pp. 485–486, 494, 5 figs., 1953.

Excellent control of green mould [*Penicillium digitatum*: *R.A.M.*, 32, p. 310] on oranges was obtained at the Citrus Wastage Research Laboratory, Gosford, New South Wales, by dipping the fruit in a mixture of dowicide A and hexamine [cf. 34, p. 92]. Diphenyl wraps [33, p. 670] were as effective as borax treatment against green mould and more so for the control of stem-end rot [*Diaporthe citri*: loc. cit.].

Investigations on lemon storage demonstrated that dipping in 500 p.p.m. 2,4-D [33, p. 658] reduced stem-end rot after six months' storage from 50 to 5 per cent., 85 per cent. of the buttons retaining their green colour, provided the trees had received routine Bordeaux sprays. Spraying alone, between February and April, also gave some control.

Plant diseases. Frost injury of Wheat. Magnesium deficiency of Citrus. New plant diseases.—*Agric. Gaz. N.S.W.*, 64, 8, pp. 431–435, 7 figs., 1953.

Magnesium deficiency of citrus [cf. *R.A.M.*, 32, p. 670] is serious in orchards along the Murray River. Chlorotic leaves are shed in the autumn and winter, resulting in a reduced crop the following year. Effective control is given by late winter or early spring applications of dolomite at 2 tons per acre on acid soils, or ½ ton yearly on badly drained soils or where root rot caused by *Phytophthora* [spp.] is liable to occur.

Castaño (J. J.). **Algunas observaciones sobre la 'llaga negra' radicular del Cafeto.** [Some observations on black root rot of the Coffee bush.]—*Agricultura trop.*, 9, 2, pp. 41–47, 2 figs., 1953.

This information concerning the identity, etiology, and control of coffee black rot in Central and South America, attributed primarily to *Rosellinia* spp., has already been noticed from another source [*R.A.M.*, 32, p. 480].

Wallace (G. B.). **Die-back in Coffee: relation of pruning methods to forms of the disease.**—*Mycol. Circ. Dep. Agric. Tanganyika* 32, 4 pp., 4 figs., 1953.

A wilt involving individual twigs on single stem coffee trees and whole uprights of multiple stem trees was observed in Tanganyika early in 1953 [cf. *R.A.M.*, 26, pp. 13, 233]. In all cases there were exposed cut surfaces below or adjoining the affected parts. When these were removed it was found in many cases that the wood beneath the exposed surfaces was rotted and that the rot was spreading to the adjoining tissues. The condition was aggravated in 1953 by dry weather, and by the current practice of pruning flush with the part below.

It is suggested that pruning cuts on single stem trees should be protected from drying out by coating with tar. In converting established coffee from single to multiple stem the original single stem should be cut not less than 6 in. above the uppermost upright shoot which is to be encouraged. The cut should slope at a slight angle and the lung branch should be left between the top upright and the cut in order to maintain the living tissue above the uprights. The normal painting should also be done. From the commencement of the first cycle of multiple stems on converted trees the lowest pair of branches on each of the two upper uprights should be left, and at the end of the first cycle the uprights should be cut back to several inches above the pairs of branches, the latter being cut back as required to form lung branches for the second cycle.

Other causes of die-back are described, some of which operate in conjunction with pruning die-back.

Young (V. H.) & Smith (H. E.). **Soil fumigation for control of root knot and Fusarium wilt of Cotton.**—*Arkans. Fm Res.*, 2, 1, pp. 2–3, 1 fig., 1953.

Soil fumigation with dowfume W-85 (ethylene dibromide) in cotton plots in Arkansas during 1952 resulted in striking control of *Fusarium* wilt [*F. vasinfectum*: *R.A.M.*, 29, p. 561] when this and root knot nematodes [cf. 32, p. 251] were present, but no yield increases were secured when there were no obvious symptoms of either. The cost of fumigating cotton soil at a rate of 2 gals. per acre in the row is approximately $10 per acre. Therefore, provided the soil is sufficiently fertile to ensure a high yield, fumigation should be profitable when both root knot and *Fusarium* are causing serious losses.

Kamal (M.) & Wood (R. K. S.). **Role of pectic enzymes in the Verticillium wilt disease of Cotton.**—*Nature, Lond.*, 175, 4449, pp. 264–265, 1955.

The mechanism by which *Verticillium dahliae* produces wilt symptoms in young cotton plants [cf. *R.A.M.*, 33, pp. 747, 748] was investigated in the Botany Department, Imperial College of Science and Technology, London, by assaying culture solutions. Filtrates from culture media containing sucrose, potassium nitrate, and mineral salts had little protopectinase activity, hardly any pectinesterase activity, were relatively non-toxic to parenchyma cells, and caused little vascular browning. Cotton shoots in these solutions wilted irreversibly in eight to ten hours. Similar results were obtained after the solutions had been dialysed or autoclaved. In all cases, however, wilting was greatly delayed when conditions

were unfavourable for transpiration, and wilted shoots did not recover on transfer to water unless the lower part of the stem was removed. Water loss by shoots in the filtrates was only slightly reduced but its uptake was greatly retarded.

Solutions from cultures on a medium containing glucose, ammonium sulphate, pectin, and mineral salts also had hardly any pectinesterase activity and caused irreversible wilting of shoots in eight to ten hours but caused pronounced browning and had high protopectinase activity. The last property was lost on autoclaving and the ability to cause browning and the toxicity to parenchyma cells were greatly reduced. The wilting activity, however, was scarcely affected.

Adzhabyan (A.) & Galaev (G.). Эффективность разновозрастных цветков при внутрисортовых скрещиваниях Хлопчатника. [The effect of different-aged flowers in intravarietal crossings of Cotton.]—Хлопководство [*Cotton Raising*], 4, 1, pp. 37–41, 1955.

At the Armenian Scientific Research Institute of Technical Cultures, U.S.S.R., in 1953 intravarietal crossings of cotton yielded lines which gave increased yield and possessed resistance to *Verticillium* wilt [*V. dahliae*: *R.A.M.*, 33, p. 603; and *V. albo-atrum*: 32, p. 312].

Dickson (R. C.), Johnson (M. McD.), & Laird (E. F.). **Leaf crumple, a virus disease of Cotton.**—*Phytopathology*, 44, 8, pp. 479–480, 1 fig., 1954.

Leaf crumple of the Acala 4–42 cotton variety has been observed for several years past in the Coachella and Imperial valleys of California, the incidence of the disease increasing throughout the summer and sometimes reaching 100 per cent. by midsummer. The primary symptom is hypertrophy of the interveinal leaf tissue, accompanied in severe cases by shortening of the veins. It may be restricted to a few spots, causing elevations of 1 to 10 mm. in diameter, or involve nearly all the interveinal tissue and induce a downward curling of the margins resulting in an inverted cupping of the entire leaf. The petals may be similarly affected. Vein-clearing and interveinal chlorosis are sometimes observed in the foliage and may be connected with the disease.

The symptoms of leaf crumple are distinct from those of leaf curl in Africa [*R.A.M.*, 31, p. 327] and of crazy top in Arizona [4, p. 166]. They also appear to differ from those of all other virus diseases of cotton. Transmission of the virus responsible for crumple has been obtained only by grafting and by the transfer of adult whiteflies, *Trialeurodes abutilonea* and *Bemisia inconspicua*, from infected to healthy plants, the former giving 37·1 and the latter 16·7 per cent. positive results.

Šutić (D.). Примена бордовске чорбе у сузбијању бактериозе на Памуку. [Application of Bordeaux mixture for the control of Cotton bacteriosis.]—*Zasht. Bilja* [*Plant Prot., Beograd*]. *1953*, 19, pp. 17–27, 1 fig., 1953. [English summary.]

Experiments at the Agricultural College, Zemun, Yugoslavia, in 1951 and 1952 to determine the influence of Bordeaux mixture on the degree of infection of cotton artificially inoculated with *Bacterium* [*Xanthomonas*] *malvacearum* [*R.A.M.*, 33, p. 545] on injured and uninjured leaves have shown that it was highly effective at 2 per cent. in the greenhouse, leaf infection being 17·8, 5·9, and 9·5 times smaller on leaves sprayed immediately after injuring and before infecting with the bacterial suspension, on those sprayed before injuring and infecting, and on uninjured leaves before infecting, respectively, than on the unsprayed, which had a disease index of 91. In the field infection was reduced only 4·6, 1·8, and 4·4 times, respectively.

Mains (E. B.). **Species of Cordyceps on Spiders.**—*Bull. Torrey bot. Cl.*, 81, 6, pp. 492–500, 14 figs., 1954.

As a result of a study at the University of Michigan, Ann Arbor, of the available collections of *Cordyceps* on spiders [*R.A.M.*, 20, p. 575] full descriptions are given of *C. thaxteri* [18, p. 798], *C. engleriana* [14, p. 443], *C. arachneicola* [20, p. 575], *C. cylindrica* [17, p. 240], *C. ignota* [26, p. 153], *C. caloceroides* [17, p. 240], *C. grenadensis* n.sp. on a ground spider at Grand Étang, Grenada, and *C. singeri* n.sp. on trapdoor spiders at Tucumán, Argentina. A key to these species is provided.

Lichtwardt (R. W.). **Three species of Eccrinales inhabiting the hindguts of Millipeds, with comments on the Eccrinids as a group.**—*Mycologia*, 46, 5, pp. 564–585, 29 figs., 1954.

This paper presents observations on three commensal fungi belonging to the genus *Enterobyrus* found in the hind-guts of millipedes, viz. *E. elegans* from *Spirobolus americanus* in Michigan, Illinois, and North Carolina, *E. euryuri* n.sp. from *Euryurus erythropygus* in Illinois, and *Enterobyrus apheloriae* n.sp. from *Apheloria iowa*, also in Illinois.

Jauch (Clotilde) & Ogloblin (A.). **Un hongo parásito de Acridios.** [A fungus parasite of *Acridium*.] *Rev. Invest. agríc., B. Aires*, 7, 3, pp. 193–212, 6 pl., 2 figs., 1953.

The authors describe a yeast-like fungus attacking grasshoppers throughout Buenos Aires province and in Rio Negro, Argentina, and also at Vallenar, Chile. The disease attacked adults of *Dichroplus maculipennis*, *D. elongatus*, *D. pratensis*, and *D. conspersus* under natural conditions from January to April, the driest part of the year. These species and *Eutryxalis strigata*, *Orphulella punctata*, *Ommexecha macropterum*, *Coryacris angustipennis*, *Xyleus* sp., *Schistocerca cancellata*, *D. bergii*, and *Osmilia violacea* were infected artificially. The yeast-like phase was found in the haemolymph of affected grasshoppers and the resistant spores in the body cavity. The fat reserves were the primary seat of infection. In culture the organism is filamentous, producing chlamydospores, synnemata, phialides, and phialospores.

In the absence of sexual reproduction the fungus is classified as a member of the Stilbaceae; it closely resembles *Isaria stenobothri* on *Stenobothrus* spp. [*R.A.M.*, 23, p. 107] but not as described by Fitzgerald on transference to *Phoma* [loc. cit.], *P. stenobothri* forming pycnidia in culture and differing markedly in pathological anatomy. A detailed comparison of *I. stenobothri*, *P. stenobothri*, and the fungus found in Chile and Argentina is presented in tabular form. The authors prefer not to erect a new genus or species in view of the present confusion regarding the taxonomy of *Isaria* and lack of sufficient data.

Flor (H. H.). **Longevity of uredospores of Flax rust.**—*Phytopathology*, 44, 8, pp. 469–471, 1954.

In experiments at State College Station, Fargo, North Dakota, uredospores of race 236 of flax rust (*Melampsora lini*) [*R.A.M.*, 33, p. 423], stored in glass vials (aerated or stoppered), survived for seven days in an unwhitewashed greenhouse at 13° to 43° C., 18 in a whitewashed at 20° to 34°, 24 in the laboratory at 19° to 25°, 300 at 3° and —4°, and 1,295 at —10° [cf. 5, p. 555; 32, p. 20]. During 3½ years' storage the spores withstood 36 alternate coolings to —10° and warmings to 20° to 25°.

Weber (N. A.). **Pure cultures of fungi produced by Ants.**—*Science*, 121, 3134, p. 109, 1955.

In studies at Swarthmore College, Pennsylvania, and in Panama and Florida, it

was found that ants of several genera could maintain fragments of 'fungus gardens' in the pure condition on agar plates despite abundant growth of surrounding alien fungi. It is postulated that the salivary and anal secretions of the ants may play a primary part in creating conditions for pure cultures of ant fungi (not yet identified).

Muskett (A. E.). **Seed health in relation to Flax.** *Brit. agric. Bull.*, 5, 23, pp. 317–318, 1953.

This is a general discussion of the development of seed treatment of flax since 1938 [*R.A.M.*, 32, p. 558].

Jenkins (W. R.). **Pathogenic races of Diplocarpon rosae, the Rose black-spot fungus.**—Abs. in *Phytopathology*, 44, 7, p. 389, 1954.

During 1953 detached leaflets from a group of 20 roses of the major genetic classes were inoculated, after rubbing off the waxy bloom, with 22 isolates of *Diplocarpon rosae* from 17 localities in the United States, using spore suspensions from cultures grown on canned green pea infusion agar for five to seven weeks at 70° to 72° F. The leaflets were then placed on cotton mats moistened with a 2 per cent. sucrose solution in closed culture dishes and incubated for eight days at 75°, with illumination for eight hours daily. Based on the number of leaflets infected and the diameter of the spots 19 distinct races of the fungus were identified with a wide range of pathogenicity, one isolate attacking only eight and three strains all 20 of the test roses.

Ramsfjell (T.) & Uldal (B.). **Bekjempelse av rotsvartsopp på Cyclamen.** [Control of the black root fungus on Cyclamen.] Reprinted from *Gartneryrket, 1954*, 19, 2 pp., 14 figs., 1954.

Effective control of brown root rot (*Thielaviopsis basicola*) of cyclamen [*R.A.M.*, 34, p. 152] was obtained in two nurseries in Rogaland, Norway, during 1952 and 1953 by soil sterilization, before potting the plants, with steam, chloropicrin at the rate of 250 ml. per cu. m. soil, or 2·5 per cent. formalin solution (5 l. per 15 l. soil). Three applications of 0·5 per cent. ferbam to the growing plants also gave satisfactory results.

Westerman (E.). **Fungus and its association with seed germination.**—*Aust. Orchid Rev.*, 19, 4, pp. 173–174, 1954.

In glasshouse experiments carried out in South Australia seeds of *Cymbidium*, *Cattleya*, and *Dendrobium* species were germinated on nutrient agar plus oat starch (pH 5) in flasks, which were then inoculated with *Rhizoctonia repens* [*R.A.M.*, 16, p. 115; 31, p. 74]. *R. mucoroides* was used in similar tests with *Phalaenopsis* and *Vanda*. Three weeks later the protocorms began to turn green, leaf points appearing in another fortnight. On Knudson's C solution [cf. 23, p. 403] inoculated at the same time leaf formation took two months longer. Seedlings transplanted on to inoculated compost (tan-bark, leaf mould, and bone meal for *Cymbidium* and *Dendrobium* and fine *Osmunda* fibre for the other three genera) were superior to those on the non-inoculated. Knudson's method, by which seeds are germinated in a solution of mineral salts and sugar, without a fungus, is recommended for large-scale work by the commercial orchid grower. The use of a fungus as a stimulant, however, produces healthier and stronger seedlings and is feasible for amateurs.

Luttrell (E. S.) & Samples (J. W.). **Mildew of Lupins caused by Microsphaera diffusa.** *Plant Dis. Reptr.* 38, 10, pp. 719–720, 1954. [Multilithed.]

Greenhouse observations at the Georgia Experiment Station, Experiment, during

the winter of 1953–4, indicated that blue lupins (*Lupinus angustifolius*) were highly susceptible to mildew (*Microsphaera diffusa*) [cf. *R.A.M.*, 33, p. 155] while white (*L. albus*) and yellow (*L. luteus*) ones showed moderate susceptibility in the seedling stage, becoming highly resistant (particularly the yellow) with age. Two varieties of each were planted. Transfer of diseased lupins and *Lespedeza* from the greenhouse to outdoor beds demonstrated that the fungus can cause severe infection of blue lupins under field conditions late in the growing season, provided inoculum is present.

Du Plessis (S. J.) & Truter (J. A.). **Brown spot disease of Lupins caused by Pleiochaeta setosa (Kirchn.) Hughes.**—*Sci. Bull. Dep. Agric. S. Afr.* 347, 12 pp., 5 figs., 1953.

Brown spot disease of lupins, caused by *Pleiochaeta setosa* [*R.A.M.*, 30, p. 584], was observed on *Lupinus mutabilis* in S. Africa for the first time in 1950. Since then the disease has been observed on *L. angustifolius* and *L. albus*, occurring on the flowering parts, stems, seed, and pods, as well as the leaves. *P. setosa* infects both injured and uninjured lupin leaves and is seed-borne, but if infected seeds germinate they are soon killed by the fungus. The pathogen is able to survive in the conidial stage for over 12 months on infected plant material.

Experiments have indicated that control by spraying or dusting with Bordeaux mixture is only satisfactory on ornamental lupins. There is some hope of breeding resistant varieties.

Halpin (J. E.), Hanson (E. W.), & Dickson (J. G.). **Studies on the pathogenicity of seven species of Pythium on Alfalfa, Sweetclover, and Ladino Clover seedlings.** —*Phytopathology*, 44, 10, pp. 572–574, 4 graphs, 1954.

Some of the information presented in this paper on the relative pathogenicity of seven species of *Pythium* [*R.A.M.*, 34, p. 155] to lucerne, sweet clover [*Melilotus* sp.], and Ladino clover in Wisconsin has already been noticed [33, p. 608]. Nearly all the Ladino clover seedlings in sand culture in the greenhouse were killed before emergence by *P. debaryanum*, *P. irregulare*, *P. splendens*, and *P. ultimum*, while *P. splendens* was slightly less virulent than the foregoing at 16° to 24° C. but equally so at 28°. *P. paroecandrum* destroyed from 56 to 85 per cent. of the lucerne seedlings, 70 to 92 per cent. of *M.* sp., and 65 to 79 per cent. of Ladino clover, depending on the temperature. The only effect of *P. arrhenomanes* was to cause a very light tan discoloration of the secondary roots, while *P. rostratum* was completely non-pathogenic in all the trials.

Latter (B. D. H.). **Physiologic races of subterranean Clover rust.**—*J. Aust. Inst. agric. Sci.*, 19, 4, pp. 248–250, 1 fig., 1953. [Received 1954.]

Two races of *Uromyces trifolii subterranei* occur on subterranean clover in Australia [*R.A.M.*, 23, p. 490], race A in New South Wales, Victoria, Tasmania, and South and Western Australia, and the more virulent race B in four localities in Victoria and at Bombala on the southern tableland of New South Wales.

Carnahan (H. L.) & Graham (J. H.). **Sources of resistance to Pyrenophora bromi among species of Bromus.** –*Plant Dis. Reptr*, 38, 10, pp. 716–718, 1954. [Multilithed.]

In greenhouse inoculation experiments at the United States Regional Pasture Research Laboratory, State College, Pennsylvania, in which plants of 19 *Bromus* species were sprayed with a spore suspension of *Pyrenophora bromi* [*R.A.M.*, 31, p. 556] a high degree of resistance was observed in certain weedy annuals, particularly *B. japonicus* and *B. tectorum* var. *nudus*, but in no species closely related to

B. inermis. The moderately resistant tetraploid, *B. sibiricus*, appears to be the only source of resistance for possible breeding material in the Bromopsis section.

Bovay (E.) & Favre (C.). **Le dépérissement du Pommier Reinette du Canada en Valais. I. Essais de fumures et diagnostic foliaire. II. Recherches agrologiques.** [Wilt of the Reinette du Canada Apple in Valais. I. Manuring experiments and leaf diagnosis. II. Soil investigations.]—*Rev. rom. agric.*, 10, 7, pp. 55–56, 3 figs.; 8, pp. 63–64, 2 graphs, 1 diag., 1954.

Wilting of apple trees [*R.A.M.*, 32. p. 84; 33, p. 157], particularly the Canada Pippin variety, has been progressing in central Valais, Switzerland, since 1945 on trees of all ages. Affected plants show stunted leaves with brown, curled margins, and terminal rosette formations. The branches remain yellowish-green to grey. The numerous fruits fall prematurely.

Manuring experiments at Leytron and Magnot-Ventroz indicated that the wilting was not caused by a pathogenic agency but by inadequate and unbalanced nutrition aggravated by drought. Leaf analyses showed that healthy leaves contained higher amounts of nitrogen, phosphorus, and potassium.

In the second paper the authors report on soil investigations at the Federal Agricultural Experiment Stations, Lausanne, to determine the contributory factors. It is tentatively concluded that the wilt is due chiefly to water and fertilizer deficiency aggravated by exposure to sun and wind, but the competition of grass, and the high alkalinity of certain soils also appear to be involved. Experimental pruning induced fresh vigour, provided the trees were not too old or impaired in their health, and the operation was supported by a complete mineral fertilizing programme, adequate irrigation, and control measures against insects and fungi which weaken the trees. These researches are to be extended to other soil types before the limited findings so far obtained can be generalized.

Delmas (H.-G.). **Sur un cas de dépérissement des Pommiers dans la haute vallée du Tech (P.-O.).** [On a case of decline of Apple trees in the upper valley of the Tech (P.-O.).]—*C.R. Acad. Agric. Fr.*, 39, 9, pp. 473–476, 1953.

Zinc deficiency discovered among Reinette du Canada apple trees in the upper Tech valley, eastern Pyrenees, during 1951 [*R.A.M.*, 31, p. 494] was remedied by spraying with a 5 per cent. zinc sulphate solution before bud burst.

Jacks (H.) & Brook (P. J.). **Control of black spot of Apples.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 1, pp. 78–89, 1954.

In trials during three seasons (1950–3), in Auckland, Hastings, and Nelson, New Zealand, control of apple scab (*Venturia inaequalis*) [*R.A.M.*, 33. p. 308] by 0·21 per cent. ferbam or 0·15 per cent. thiram, used until closed calyx and at 0·14 and 0·1 per cent., respectively, thereafter, was comparable to that given by the 'standard' programmes of Bordeaux mixture and lime or colloidal sulphur. Similar control was obtained with 2·5 per cent. phenyl mercury chloride (ascospray and venturicide) at 2 lb. per 100 gals. without causing excessive damage on Delicious, Dougherty, Dunn's Favourite, Granny Smith, Jonathan, and Parlin's Beauty, but severe damage occurred on Sturmer and Crimson Cox in Hastings and Cox's Orange in Nelson. To avoid mercury residues on fruit phenyl mercury chloride should be replaced after mid-December by less toxic fungicides. Puratized and captan showed promise but were not sufficiently tested for evaluation. Ialine copper and fungex damaged the trees, crag 341 C and phygon XL caused fruit russet, and cosan was ineffective against scab. The period about petal fall and closed calyx is critical for fruit infection.

Outbreaks and new records.—*F.A.O. Pl. Prot. Bull.*, 1. 5, pp. 75–76. 1953.

G. A. H. Hellson reports that during a period of five years about 60 per cent. of the young stone fruit trees in the Central Otago District, which produces one-third of the total stone fruit crop in New Zealand, have been killed by blast disease (*Pseudomonas syringae*) [*R.A.M.*, 34, p. 159]. Cherry rasp leaf virus [33, p. 611] has recently been found in New Zealand for the first time, affecting sweet, sour, and mazzard cherries.

Plant diseases. Fleck of Quince and Pear.—*Agric. Gaz. N.S.W.*, 64, 5, pp. 246–249, 6 figs., 1953.

Quince trees in New South Wales are severely attacked by fleck (*Fabraea maculata*) [*R.A.M.*, 32, p. 175], particularly in the coastal and tableland areas. In small gardens the disease may be controlled by regular pruning and burning of the leaves. Orchards should be sprayed with 15–15–100 Bordeaux or 1-20 lime-sulphur at greentip, then lime-sulphur 1–40 at early white, 1–80 at petal fall, and the same again three weeks later.

On pear [loc. cit.] *F. maculata* causes less serious leaf infection but severe fruit spotting and cracking. The quince spray schedule is effective on pear, but it is advisable to use wettable or colloidal sulphur or thiram instead of lime sulphur at petal fall.

Cochran (L. C.) & Stout (G. L.). **Apricot ring pox.**—*Bull. Calif. agric. Exp. Sta.*, 42, 1, pp. 7–10, 1 col. pl., 1 fig., 1953.

The authors describe the distribution, symptoms, transmission, and control of, varietal reaction to, and effect of environmental factors on ring pox, a destructive virus disease of apricots [*R.A.M.*, 30, p. 572], with particular reference to southern California.

Willison (R. S.) & Weintraub (M.). **Studies on stone-fruit viruses in cucurbit hosts. IV. Some effects of hydrogen ion concentration and dilution on infectivity. V. Thermal inactivation of some isolates.**—*Phytopathology*, 44, 9, pp. 533–542, 5 graphs, 1954.

At the Plant Pathology Laboratory, St. Catharines, Ontario, Canada, the effects of hydrogen-ion concentration on the infectivity of 11 stone fruit virus isolates *in vitro* were studied in comparative ageing tests at 0° C. performed with aliquots of crude juice obtained from infected Wisconsin Model cucumber plants [cf. *R.A.M.*, 33, p. 158 and above, p. 280] and diluted with water and buffers consisting of 1 per cent. dipotassium phosphate adjusted with citric acid to pH 8·5, 6·7, 5·7, and 4·7. The dilution tolerance of the several isolates under optimum conditions ranged from 10^{-2} to over 10^{-4}.

Isolate Y.2 of the cherry yellows group proved to be separable into at least two components when aliquots of inoculum from abnormally dark green plants were diluted to 10^{-1}, one with water and the other with buffer at pH 5·7 to 6. The components differed in the symptoms they induced, type A (the water dilution) causing an unusually dark green coloration with relatively little chlorosis and type B (the buffered aliquot) profuse chlorotic spotting and ring patterns; they also differed in response to ageing and thermal inactivation. Thus, B diluted with either water or buffer was characterized by a low level of infectivity after exposure to 35° for 10 minutes and a high one after the same length of time at 40° to 45°. Moreover, the thermal coefficient of component A appeared to be generally lower than that of B, but studies on 13 isolates under varying environmental conditions yielded inconsistent results in respect of this criterion, the inactivation end point shifting by up to 15° according to the temperature at which the source plants were grown.

For instance, preparations from plants grown at 75°, 80°, and 85° F. were inactivated at 55° to 60°, 50°, and 45° to 50°, respectively.

Smith (W. L.), McClure (T. T.), & Haller (M. H.). **Post-harvest treatments for the reduction of Peach decays.**—Abs. in *Phytopathology*, 44, 7, p. 390, 1954.

Applied to peaches within three hours of inoculation [at the Michigan Agricultural Experiment Station] with spore suspensions of *Monilinia* [*Sclerotinia*] *fructicola*, isothan Q 15 [*R.A.M.*, 31, p. 335], captan, and dowicide A sprays and sulphur dust reduced infection by 74, 73, 63, and 65 per cent., respectively (average of three years), after six days at 75° F. The corresponding figures (two-year average) for imidazoline, Shell XP63, and N 521 sprays were 60, 55, and 45 per cent., respectively, and for Shell AL 126 and rimocidin, used in one year only, 57 and 44 per cent., respectively. Under the same conditions decay due to *Rhizopus nigricans* [*R. stolonifer*] was controlled only by dowicide A and rimocidin, which effected reductions of 38 and 62 per cent., repectively. Fumigation with tetra- or trichloroethylene at 75° was ineffectual against *S. fructicola* but reduced infection by *R. stolonifer*. Dusting with sulphur followed by tetrachloroethylene fumigation at 75° reduced injury by both species. When the fruits were fumigated at 40° and held at that temperature for four days before transference to 75°, neither tetra- nor trichloroethylene was effective against either pathogen, but sulphur dust controlled *S. fructicola* as well as it did on peaches maintained continuously at the higher temperature.

B[ovey] (R.). **La panachure du Cerisier.** [Variegation in the Cherry tree.]—*Rev. rom. Agric.*, 10, 7, p. 60, 1 fig., 1954.

Variegation is frequent in cherry trees in Swiss orchards. It is accompanied by a reduction in the size of the leaves, marginal irregularities and crumpling of the surface, which is mottled with light green, yellow, and white spots. Fruits are small and few; in serious cases the crops are greatly reduced.

This variegation is not caused by a virus and is not transmissible from stock to scion; scions cut from affected trees, however, should not be used. A genetic anomaly is assumed to be the cause.

Prieur (B.). **Les maladies du Framboisier.** [The diseases of Raspberry.]—*Rev. Oka*, 27, 3, pp. 80–85, 1953.

Brief notes are given in popular terms on the symptoms and control of the chief diseases of raspberries in Quebec. Most of the information presented has already been noticed in this *Review* [cf. *R.A.M.*, 30, p. 15 *et passim*].

Aoki (K.) & Ishii (H.). **Studies on the Aecidium disease of Mulberry. (I) On the germination of aecidiospores of Aecidium mori (Barcl.) Syd. et But.**—*J. seric. Sci., Tokyo*, 23, 1, pp. 58–60, 1954. [Japanese, with English summary.]

At the Sericultural Experiment Station, Koenji, Suginami-ku, Tokyo, the aecidiospores of mulberry rust (*Aecidium mori*) [cf. *R.A.M.*, 20, p. 234] germinated better at 15° than at 5°, 10°, or 25° C. and in light than in darkness. Germination extends over a period of 48 to 72 hours, after which the germ-tubes undergo plasmolysis and die. The aecidiospores survive longer at low than at high temperatures, but the duration of viability is brief in any case.

Hill (R. G.) & Barton (R. R.). **Strawberries selected for resistance to red stele offer good variety.**—*Fm Home Res.*, 38, 281, pp. 29, 31, 1 fig., 1953.

The following strawberry varieties resistant to red stele [red core: *Phytophthora fragariae*: *R.A.M.*, 32, p. 633 and next abstract] are recommended for cultivation

in Ohio, where the disease has become a serious problem in some areas: Fairland [29, p. 461], Temple [loc. cit.], Pathfinder [29, p. 349], Aberdeen [loc. cit.], Red Crop, Sparkle, and Vermilion.

Vaughan (E. K.), Roberts (A. N.), & Mellenthin (W. M.). **The influence of Douglas Fir sawdust and certain fertilizer elements on the incidence of red-stele disease of Strawberry.**—*Phytopathology*, 44, 10, pp. 601–603, 1954.

At a farm near Corvallis, Oregon, the incidence of *Phytophthora fragariae* was increased in a plot of strawberries on silty clay loam soil by a 4-in. mulch of Douglas fir [*Pseudotsuga taxifolia*] sawdust from 7·9 to 12·7 per cent. in 1950 and from 8 to 35·9 per cent. in 1952. In the former year the incorporation of similar amounts of sawdust into the soil did not significantly raise the percentage of infection; in the latter 16·6 per cent. of the plants developed red stele [red core: see preceding abstract] in the treated areas. The extension of the disease in the mulched soil is attributed to a decrease in temperature and an increase in moisture content of the soil.

Unduly heavy applications of nitrogen to the soil also promoted the spread of red core. In four years of testing, annual amendments in excess of 100 lb. actual nitrogen per acre augmented the proportion of diseased plants.

Gallay (R.), Bovey (R.), & Perraudin (G.). **La sélection du Fraisier en Valais.** [Strawberry selection in Valais.]—*Rev. rom. Agric.*, 9, 1, pp. 6–8, 2 figs., 1953.

The Swiss Federal Agricultural Experiment Stations, Lausanne, are to release a first lot of selected Madame Moutot strawberry plants free from all serious virus diseases [*R.A.M.*, 32, p. 302; 34, p. 232]. To maintain the healthy condition of this variety it is suggested that the multiplication of selected plants should be strictly confined to high altitudes and preferably to localities where the growers agree not to grow plants for the fruits. Growers of plants selected for multiplication should form an official organization. The selected plants, grown in plantings inspected by qualified experts recognized by an official organization, should be sold under a special mark and distinguished by a special wrapping.

Alfaro (A.) & Vicente (S.). **Pequeños ensayos con fungicidas.** [Small-scale experiments with fungicides.]—*Bol. Inst. Invest. agron., Madr.*, 14, 30, pp. 163–177, 10 figs., 1954.

In small-scale tests at the Irrigated Crops Station, Saragossa, Spain, two applications of 0·5 per cent. nabam conferred a measure of protection on vines against the attacks of *Coniothyrium diplodiella* [*R.A.M.*, 32, p. 419], to which the Moscatel variety was the most and Garnacha the least susceptible, Vidao and Cribatinaja being intermediate in their reactions.

Four treatments with zineb (0·25 per cent.) gave satisfactory control of vine downy mildew (*Plasmopara viticola*) [loc. cit.] on Garnacha and white varieties. It was highly phytotoxic to 'water' shoots of pears in trials against scab [*Venturia pirina*], which was more effectively combated, though not entirely eliminated, by 0·25 per cent. captan.

Wilson (J. D.). **Spray testing.**—*Fm Home Res.*, 38, 282, pp. 47, 62–63, 2 figs., 1953.

A description is given of equipment embodying the T-jet nozzle and a gauge, constructed by the United States Department of Agriculture Engineering Laboratory, Toledo, and capable of measuring the quality of the spray material delivered with an accuracy of 1/1,000 gall. per minute. It is to be used for studying several phases of spray application, particularly those connected with low volume and reduced pressure.

Wolf (C. N.), Schuldt (P. H.), & Baldwin (M. M.). **s-Triazine derivatives—a new class of fungicides.**—*Science*, 121, 3133, pp. 61–62, 1955.

Preliminary evaluation studies indicated the high fungitoxic activity of compounds selected from the class of 2,4-dichloro-*s*-triazines, having arylamino or aryloxy groups in the 6-position. The triazine derivatives were prepared by reaction of cyanuric chloride with arylamines or phenols; under suitable conditions the halogens of the first-named can be replaced in a stepwise manner. Aqueous solutions were formulated with 5 per cent. acetone and 0·01 per cent. triton X-155. The test organisms were *Alternaria oleracea* [*A. brassicicola*] and *Sclerotinia fructicola*.

The results showed that in the 2,4- dichlorophenoxy series, introduction of more than one aryloxy group markedly reduced fungistatic activity. In general, replacement of more than one chlorine of cyanuric chloride appeared to yield products of inferior fungitoxicity. The chloroanilino and bromoanilino derivatives were highly effective against both *A. brassicicola* and *S. fructicola*. In general, the arylamino-*s*-triazines showed little or no phytotoxicity to the foliage of bean, maize, and tomato plants when applied as a 1 per cent. spray.

In greenhouse tests with *A. solani* and *Phytophthora infestans* on tomato the most effective compound was 2,4-dichloro-6-(*o*-chloro-anilino)-*s*-triazine, which also showed promise of effective control of a number of common fruit, vegetable, and turf diseases.

Alcorn (S. M.) & Ark (P. A.). **The effect of candicidin on plant pathogenic fungi.**—*Plant Dis. Reptr*, 38, 10, pp. 705–709, 1954. [Multilithed.]

At the Department of Plant Pathology, University of California, Berkeley, 1:10,000 semi-crude candicidin [*R.A.M.*, 33, p. 104] inhibited the germination on water agar plates of over 90 per cent. of the spores of *Botryotinia* [*Sclerotinia*] *fuckeliana*, *Monilinia* [*S.*] *fructicola*, *Puccinia antirrhini*, *Uromyces caryophyllinus* [*U. dianthi*], and *U. phaseoli* [*U. appendiculatus*] and of 84 per cent. (compared with 62 for dithane Z-78 at the same concentration) of the uredospores of a *Puccinia* sp. from *Elymus triticoides*. One spray of candicidin at 1 in 5,000 three days before inoculation or two at 1 in 10,000, 72 and 24 hours before, reduced infection by *U. appendiculatus* on Pinto beans (*Phaseolus vulgaris*) by about 90 per cent. without causing any injury to the plant.

Wakefield (Elsie M.). **The observers' book of common fungi.**—118 pp., 64 pl. (32 col.), 5 figs., London and New York, Frederick Warne & Co. Ltd., 1954. 5*s*.

In this small pocket book nearly 200 common species of the larger British fungi are described, with information on their edibility, and illustrated. All may be identified by the beginner without the use of a microscope. There is a key to the families and genera and a glossary of mycological terms.

Bawden (F. C.). **Research for plenty No. 3. Controlling plant diseases.**—*J. Minist. Agric.*, 59, 10, pp. 451–455, 1953.

The author analyses the effects of agricultural development and practices on the incidence of plant diseases by upsetting the biological balance. Spread of disease, means of improving crop health, and the lack of balance in scientific research are also discussed.

Verona (O.). **Malattie nutrizionali delle piante coltivate.** [Nutritional disorders of cultivated plants.]—Third edition, 207 pp., 10 col. pl., 26 figs., 1 diag., 11 graphs, Bologna, Edizioni agricole, 1953. L. 1,300.

This third edition of the author's work on nutritional disorders of plants [*R.A.M.*, 28, p. 532] represents a further attempt to bring the subject up to date

and includes an appendix containing a key for the identification of the mineral deficiencies of cereals, potato, tomato, tobacco, beet, cauliflower, fruit trees, and citrus [cf. 33, p. 672].

Wilhelm (S.). **Aerial microsclerotia of Verticillium resulting from conidial anastomosis.**—*Phytopathology*, 44, 10, pp. 609–610, 1 fig., 1954.

At the Department of Plant Pathology, University of California, Berkeley, aerial microsclerotia of *Verticillium albo-atrum* [see below, p. 319] have been observed on isolates growing on barley, pea, tomato straw, and other natural substrates, on potato dextrose agar, and on unsterilized and autoclaved soils. Following anastomosis of the conidia by means of exceedingly fine tubes, of which three or four may be emitted by a single conidium, the conidial walls become thickened, dark, and carbonized, and the resultant microsclerotium remains on the conidiophore. Single conidia occasionally enlarge and form resting spores, which may be regarded as chlamydospores, without preliminary anastomosis. The aerial microsclerotia herein described somewhat resemble the cerebriform type of sclerotium upon which Van Beyma thoe Kingma erected the trinomial *V. dahliae* f. *cerebriforme* [*R.A.M.*, 19, p. 368].

Little is known concerning the function in nature of the conidia of *V. albo-atrum*, a typical representative of the Gloiosporae [20, p. 496], characterized by moist conidia adapted to water and insect dissemination. They succumb within three days in a dry atmosphere at 49° to 50° C. and inside a fortnight at 40°. On the other hand, the microsclerotia formed in plant tissue survive for six months at 49° to 50° in a dry state and for over 2½ years at 40° (abs. in *Phytopathology*, 43, p. 589, 1953).

Microsclerotia in tomato tissue placed on the surface or pushed into moist, non-sterile soil germinate and become covered with conidial heads within a few days, and microsclerotia may again be produced by conidial anastomosis. This mode of rejuvenation may be an important means of survival of the pathogen in the saprophytic phase. Aerial microsclerotia formed on plant refuse near the soil surface may be readily disseminated by wind, a method of transmission suggested by the occurrence of outbreaks of infection in virgin soil newly brought into cultivation [*R.A.M.*, 29, p. 540].

Phinney (H. K.) & Hardison (J. R.). **Immobilization of fungus spores and other minute objects in water mounts.**—*Mycologia*, 46, 5, pp. 667–669, 2 figs., 1954.

At the Department of Botany and Plant Pathology, Oregon State College, minute biological objects are rendered immobile by mounting in sodium carboxy-methyl cellulose grade CW-72, lot type 70 (E.I. du Pont de Nemours & Co., Inc., Wilmington 28, Delaware). The dry powder is added directly to the water suspension of the material on a slide in sufficient quantity to obtain a medium of the required viscosity. A suspension of 12 per cent. (refractive index 1·3418) gives a suitable gel, but for very small objects it may be advantageous to use initially less than 12 per cent., applying the chemical evenly in small quantities to the water until the gel is seen. Immediate addition of the cover-glass and application of pressure produces a thinner layer of medium than is obtainable by starting with a denser gel. Evaporation of part of the water from the medium will then produce the consistency necessary for immobilization.

Reitman (M.), Moss (M. L.), Harstad (J. B.), Alg (R. L.), Gross (N. H.), & Miller (W. S.). **Potential infectious hazards of laboratory techniques. I. Lyophilization. II. The handling of lyophilized cultures. III. Viral techniques.**—*J. Bact.*, 68, 5, pp. 541–554, 2 figs., 1 diag., 1954.

In this series of studies at Camp Detrick, Maryland, it was found that a lyo-

philizer [cf. *R.A.M.*, 33, p. 745] and the operator's hands become heavily contaminated during operation. A simple, double trap cotton filter, consisting of two separate blocks of cotton, placed between the condenser and the connecting arm, prevented contamination of the vacuum gauge and pump, thus providing for safe dismantling of the apparatus for sterilization.

The amount of aerosol escaping when an ampoule is opened depends on the consistency of the end product, but in any case a large number of organisms is set free. Contaminations of this type and from vaccine bottles used for making dilutions of virus were greatly reduced or eliminated by surrounding the point of breakage of the ampoule or the syringe sampling needle with a cotton swab soaked in 70 per cent. ethanol. Many organisms were recovered from the air even one hour after accidental breakage of an ampoule containing lyophilized cultures. Efficient and rapid decontamination was obtained with 2 per cent. lysol, ultraviolet light, and the use of an exhaust system.

Barnett (H. L.), Lilly (V. G.), & Waters (Betsy M.). **The effects of temperature and method of sugar sterilization on growth of Thielaviopsis basicola.** *Proc. W. Va Acad. Sci.*, 25, pp. 27–28, 1953.

In cultural studies with *Thielaviopsis basicola* at the West Virginia Agricultural Experiment Station, fructose sterilized by filtration was utilized as well as or better than filtered glucose. Growth after seven days at 30° C. in a medium containing autoclaved fructose was 7 mgm. compared with 125 mgm. on filtered fructose. The inhibiting effect of the autoclaved fructose was less marked at lower temperatures and less than that of autoclaved glucose. It is suggested that further work on parasitic fungi could be carried out profitably using media sterilized by methods other than autoclaving.

Taylor (C. F.). **A device for recording the duration of dew deposits.**—Abs. in *Phytopathology*, 44, 7, p. 390, 1954.

The duration of dew deposit is recorded by an apparatus consisting of an 8 in. ground-glass disk mounted on a turntable and rotated by a clock mechanism, and a purple Mongol copying pencil mounted loosely in a vertical guide with the point resting on the disk. As dew is deposited the pencil becomes moist, leaving a broad, dark mark on the surface of the disk. Sand-blasted glass disks were the best of the deposition surfaces tested and can be cleaned with acetone. Dew is deposited and dried in about the same time as on the horizontally exposed leaves of most plants, the actual duration of the processes being determined by placing the disks over a 24-hour circular recording chart. The length of the line indicating the duration of the deposit is accurate to within a few minutes. The amount of dew present is expressed by the width of the line, and the progressive shortening of the pencil in contact with the wet surfaces produces an increasingly heavy mark. The occurrence of rain is denoted by a feathery appearance of the line.

Niethammer (A[nneliese]) & Baessler (H.). **Über das Kultivieren und Konservieren verschiedener Pilze und Bakterien in Reinkultur. (Erfahrungen aus einer Mikroorganismen-Sammlung die mit Unterstützung der Deutschen Forschungsgemeinschaft aufgebaut wurde).** [On the cultivation and preservation of various fungi and bacteria in pure culture. (Experience gained from a collection of micro-organisms established with the aid of the German Research Society).] *Z. Naturf.*, 9b, 7, pp. 456–460, 3 figs., 1954.

The writers' experience, covering a period of many years, in the culture of fungi (including some of medical interest) is supplemented by 16 bibliographical references. The following species of Mucoraceae remained viable for about 20 months on breadcrumbs: *Mucor circinelloides*, *M. griseo-cyaneus*, *M. hiemalis*, *M. mucedo*,

and *M. spinosus*, while *M. racemosus* survived for 26 months and produced gemmae. The same medium supported the growth of *Rhizopus nigricans* [*R. stolonifer*], *R. delemar*, and *R. oryzae* for 14, 10, and 12 months, respectively.

The Aspergillaceae grew satisfactorily on carrot slices and calcium sulphate lignin, filter-paper strips, and starchy media, the duration of viability for representatives of the *Aspergillus clavatus*, *A. glaucus*, *A. fumigatus*, and *A. versicolor* groups being 23, 24, 12, and 10 months, respectively, for white species 24, and for the black, yellow-green, and yellow-brown groups 16, 18 to 20, and 12 months, respectively. *Penicillium* spp. also throve on the above-mentioned media, mostly for upwards of two years, and similar observations were made in connexion with *Scopulariopsis*, *Gliocladium*, and *Acaulium* spp.

In the conidial state *Botrytis* spp., representing the Helotiaceae, remained viable for 12 to 14 months on carrot slices and in the sclerotial for 36.

Among the Mycosphaerellaceae *Chaetomium globosum* survived for at least 12 months on carrot slices, while *Cladosporium herbarum* flourished for 27 months on the same medium and cellulose strips.

The Hypocreaceae *Trichoderma koningi* and *T. lignorum* [*T. viride*] made good growth in the conidial state on carrot slices, cellulose strips, and soil, the latter species also on calcium sulphate lignin, viability persisting for up to 18 months, while the corresponding period for the rare species *T. alba* was six to eight.

Potato slices and legume straw were the most generally useful media for species of *Fusarium*, the survival periods of which (in months) were as follows: *F. aquaeductum*, *F. dimerum*, *F. merismoides*, *F. nivale* [*Calonectria nivalis*], *F. poae*, *F. lateritium*, *F. moniliforme* [*Gibberella fujikuroi*], and *F. lacti* 20, *F. semitectum* 20 to 24, *F. culmorum* 22, *F. avenaceum* 22 to 24, *F. equiseti* 8 to 24, *F. graminearum* [*G. zeae*] and *F. sporotrichioides* 12, *F. oxysporum* 18, and *F. bulbigenum* and *F. solani* 25. Conidial production in these species is very erratic and the duration of their survival depends on its abundance. The perfect state tends to develop on substrata approximating to the natural habitat. On carrot slices *Verticillium cinnabarinum* and *Cephalosporium acremonium* were still viable at 12 to 14 months.

Of the two families of Fungi Imperfecti maintained in the collection, *Oidium* [*Oospora*] *lactis* (Mucedinaceae) made equally good growth for 20 to 24 months on carrots, skim milk, and whey. The numerous Dematiaceae developed very well on carrot slices and cellulose strips, no subculturing being required after 27 to 36 months for *Alternaria tenuis*, *Stemphylium botryosum* [*Pleospora herbarum*], *S. macrosporoideum*, and *Macrosporium commune* [*P. herbarum*].

The best medium for yeasts was found to be beer wort (liquid or solidified with agar), while carrot slices, fish refuse, and synthetic nectar were suitable for many species. The survival period of *Nematospora gossypii* was only two months.

The wood-destroying fungi *Coniophora cerebella* [*C. puteana*], *Lentinus squamosus* [*L. lepideus*], *Lenzites abietina*, *L. sepiaria*, *Merulius domesticus* [*M. lacrymans*], *Polyporus* [*Polystictus*] *versicolor*, and *Poria vaporaria* lived for 12 to 14 months on carrot slices or sawdust moistened with beer wort.

GREEN (H. F.). **Bacteriostatic and fungistatic properties of benzene hexachloride.** *Chem. & Ind. (Rev.), 1955*, 8, p. 201, 1955.

At the Department of Veterinary Services, Kenya, the application to hides and skins of a dusting powder containing 10 per cent. BHC (with 1·3 per cent. *gamma* BHC) caused a marked diminution of [unspecified] mould growth.

HERNDL (J.). **Fungicide und baktericide Mittel für die Lederindustrie.** [Fungicidal and bactericidal agents for the leather industry.] *Ciba-Rdsch., 1953*, 108, pp. 3983–3985, 4 figs., 1953.

Three combined fungicides and bactericides manufactured by Ciba Ltd., Basel,

Switzerland, are recommended for use in the leather industry against damage by *Aspergillus niger* and other moulds, and for various other purposes, viz., Fungicid WK, Fungicid G Teig [see next abstract], and Fungicid L. WK is predominantly bactericidal, G Teig primarily fungicidal, and L particularly suitable for very greasy material, being soluble in organic solvents, fats, and oils.

Fungicid G Teig in der Textil- und Papierindustrie. [Fungicid G Teig in the textile and paper industry.]—*Ciba-Rdsch., 1954*, 113, pp. 4168–4169, 1954.

Fungicid G Teig [see preceding abstract] has been found to confer a high degree of protection against [unspecified] fungal and bacterial damage in the textile and paper industries. For preservation it should be used at a strength of 1 to 2 per cent. of the dry weight of the material, but if merely required as a temporary protectant during the manufacturing process a concentration of 3 to 4 per mille is sufficient. For finishing compounds G Teig should be applied at the rate of 1 to 2 per mille.

Siu (R. G. H.). **Problems and speculations on the decomposition of cellulose by fungi.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 17, 1, pp. 37–44, 1954.

Some of the problems and practical implications arising in connexion with the fungal decomposition of cellulose [*R.A.M.*, 32, p. 394] are discussed in this critical survey of the available information on the subject under the headings of fungi attacking cellulose, nutrition of cellulolytic fungi, mechanism of attack on cotton fibre, and mechanism of breakdown of the cellulose molecule. Among the industrial possibilities suggested by the work already accomplished are the preservation of cellulosic material, clarification of fruit juices, digestion of low-molecular weight impurities in cellulosic products, and the use of cellulose, partially digested by C_1 enzymes, as animal fodder. From the botanical standpoint, further studies on the transference activity of enzymes of the cellulase complex, whereby glucose is transferred as a unit from one molecule to another, might provide clues to the synthesis of cellulose in plants.

Crowdy (S. H.) & Pramer (D.). **Movement of antibiotics in higher plants.**—*Chem. & Ind. (Rev.), 1955*, 7, pp. 160–162, 1955.

The available information on the absorption and translocation by higher plants of aureomycin, chloramphenicol, granicidin, griseofulvin, mycetin, neomycin, penicillin, pyocyanin, streptomycin, subtilin, and terramycin is presented in tabular form and briefly discussed in the light of 14 contributions to the relevant literature. According to a private communication by S. H. Crowdy *et al.*, pure griseofulvin and chloramphenicol have been recrystallized from extracts of the tops of root-treated broad bean plants.

Linnemann (Frau G.). **Untersuchungen über die Mycorrhiza von Pseudotsuga taxifolia Britt.** [Studies on the mycorrhiza of *Pseudotsuga taxifolia* Britt.]—*Zbl. Bakt.*, Abt. 2, 108, 13–16, pp. 398–410, 13 figs., 1954.

Studies covering the period from 1952 to 1954 on the mycorrhiza of *Pseudotsuga taxifolia* from various parts of north-west Germany at the Institute for Forest Botany, Hann.-Münden, are fully described. The process of mycorrhizal formation was found to be initiated in the first or second growing season. The mycorrhiza were predominantly ectotrophic and the short root systems were of two types, one shallow with fan-like branches and the other finer, longer, and more profusely and irregularly branched. A fungus mantle, up to 70 μ in diameter, was occasionally observed both on unbranched, more or less thickened short roots and on typical mycorrhizal roots. Isolated intracellular hyphae, mostly slender and

sparsely branched, were detected in the cortical parenchyma of both long and short roots. Both root and mycorrhizal development varied consistently in trees of the same age grown under identical environmental conditions. Slight fungal infection of the roots on an unfavourable soil was demonstrated down to a depth of 75 cm.

LOBANOV (N. V.). Микотрофность древесных растений. [Mycotrophism of woody plants.]—232 pp., 47 figs., 1 diag., 14 maps. Moscow, State Publisher 'Soviet Science', 1953. 8 rubles 10 kopeks.

From 1946 to 1950, inclusive, a survey was made of the mycorrhiza of woody plants in the European part of the U.S.S.R. Chapter I of this book reviews the literature on the subject. Methods and objects of the survey are discussed in chapter II, while chapter III gives the distribution of the mycorrhiza. Chapters IV and V deal, respectively, with mycorrhiza-forming fungi and the physiological relation of the fungi to the plants. In chapter VI mycotrophism is discussed in relation to forest management and the multiplication of oak and pine in non-forest regions. An index is supplied to the woody plants mentioned and a nine-page bibliography is appended.

TAHA (E.-E. M.). **Über Wechselbeziehungen zwischen Schimmelpilzen. I. Der Einfluss verschiedener physiologischer Faktoren auf die Wechselbeziehungen zwischen Alternaria tenuis und Fusarium semitectum.** [On mutual relationships between moulds. I. The influence of various physiological factors on the mutual relationships between *Alternaria tenuis* and *Fusarium semitectum*.] *Arch. Mikrobiol.*, 19, 1, pp. 45–51, 3 figs., 1953. [Received February, 1955.]

The nature of the mutual relationships between *Alternaria tenuis* and *Fusarium semitectum* in pure culture on Dox and glucose-peptone-agar and various tomato extracts was shown by studies at the Fouad I National Council for Scientific Researches, Cairo, to be entirely independent of changes of temperature (10°, 25°, or 30° C.), pH values from 4 to 9, or composition of the medium, being consistently antagonistic [cf. *R.A.M.*, 8, p. 591].

On the other hand, the relations between two mycelia of an identical species, either *A. tenuis* or *F. semitectum*, were markedly influenced by alterations in the hydrogen-ion concentration or composition of the medium and to some extent by changes in temperature. For instance, they were compatible at low and antagonistic at high pH values. On North Dakota tomato extract two mycelia of *F. semitectum* were compatible at 25° and antagonistic at 10° and 30°. They were compatible at all temperatures on Dox agar. Two mycelia of *A. tenuis* were compatible on IAB tomato extract and Dox agar at 30° and on glucose-peptone-agar at all temperatures. Under the other environmental conditions reciprocal antagonism prevailed.

MAITLEN (E. G.). **The biological activity of alternaric acid.** — *Diss. Abstr.*, 14, 10, p. 1492, 1954.

In a study of the biological activity of alternaric acid, produced by *Alternaria solani* [cf. *R.A.M.*, 32, p. 517], conducted at Purdue University [Lafayette, Indiana], the substance markedly increased the carbon dioxide evolution of tomato and sunflower cuttings while the respiration of germinated tomato seeds and beetroot slices decreased significantly after 24 and 33 hours, respectively. The water balance of tomato cuttings was disturbed. The respiration and transpiration patterns increased concomitantly when compared simultaneously, typical leaf symptoms occurring two hours after their initial rise. Wilting occurred only when the respiration and transpiration rates began to decline. Wilting as a secondary

symptom expressed a few hours after lesion formation was not due to any vascular occlusion. It is suggested that the typical leaf lesion development may be due to an accumulation of alternaric acid at certain sites owing to a differential transpiration pattern in the leaflets.

NORRIS (D. O.). **The effect of virus X on yield of Potatoes—an assessment.**—*J. Aust. Inst. agric. Sci.*, 19, 4, pp. 251–256, 1953. [Received 1954.]

From a review of the literature on the effect of potato virus X on yield [cf. *R.A.M.*, 33, p. 620] the author concludes that the re-establishment of a scheme to maintain virus-free stocks of the major commercial potato varieties in Australia [24, p. 334] would be an economic proposition. Six years after being issued virus-free, the variety Up-to-Date carried 41·5 per cent. infection, which was of the milder type. The newer varieties, Sebago, Sequoia, and Saranac, had 5 per cent. or less; these varieties, however, have a tendency to accumulate strong ringspot strains of virus X which reduce the yield more than the milder ones.

BONDE (R.) & MERRIAM (D.). **A yellow spot virus in Potato varieties in Aroostook County, Maine.** *Phytopathology*, 44, 10, p. 608, 1 fig., 1954.

The symptoms of an apparently new potato virus disease affecting mostly the Katahdin variety in Maine, where it was first observed in 1949, are inconspicuous and have evidently escaped the attention of inspectors for seed certification and others interested in the production of healthy stocks. A few bright yellow, nearly circular spots (one to five or six per leaflet), ⅛ in. or less in diameter, with well-defined margins, develop on a few of the lower leaves. They resemble the lesions produced by the apple mealy bug, *Phenacoccus aceris*, when feeding on potato, as well as those of tuber blotch (*Solanum* virus 8) [potato aucuba mosaic virus], except for the absence of the necrosis characteristic of the latter. The yellow spots were also observed in a few plants of the Sebago and Mountain varieties and in several unnamed seedlings. Aphid and mechanical transmission experiments gave negative results, but the symptoms were conveyed to 22 out of 100 Katahdin plants by inarch-grafting. A diseased Katahdin seed stock yielded 500·6 bush. per acre as compared with 600·7 for a healthy stand. Experiments have shown that the virus can be eliminated by planting tuber unit seed plots and by careful selection and propagation of healthy tuber units.

HOOKER (W. J.), PETERSON (C. E.), & TIMIAN (R. G.). **Virus X resistance in Potato.**—*Amer. Potato J.*, 31, 7, pp. 199–212, 3 figs., 1954.

In this paper an account is given, based on the literature (59 items), of the following aspects of potato virus X: crop losses caused by the virus in the United States and the British Isles; strain variations; types of resistance and a number of immune types, including tolerance, hypersensitivity, and cases of natural immunity; resistance in the breeding programme and breeding for immunity.

Virus X immune selections of *Solanum acaule* (P.I. 175395 and P.I. 175396) are given in the 1953 list of the Inter-regional Potato Introduction Station, Wisconsin.

In tests carried out at the Iowa Agricultural Experiment Station to develop a means of selecting from a seedling population of potatoes the segregates immune from virus X, the initial work was carried out with a severe ring spot isolate of X from Wisconsin [*R.A.M.*, 29, p. 637] which incited on susceptible potatoes necrosis on inoculated leaves followed by systemic mottle and necrosis. Grafting and mechanical inoculation gave similar results. There were no symptomless carriers. An isolate, X5, proved equal to the ringspot strain in inducing necrosis. The selection of immune plants by screening seedlings in flats before transplanting to the greenhouse was preferable to the graft test which must be performed after field

selections have been made. Symptoms were well expressed over the range 18° to 24° C. A few flats of seedlings were experimentally screened in 1949, and subsequent tests on progenies of these, successively screened in 1950 and 1951, showed 98 per cent. of the plants grown in the field to be immune from virus X.

By 1952 screening procedures had been stabilized and finally yielded 7,000 field-worthy seedling tubers. Most progenies tested resulted from crosses of an immune with a susceptible parent, and most of them showed on an average 50 per cent. of the plants to be immune.

Of three X-immune selections from this programme included in yield trials at Clear Lake, Iowa, in 1952 Ia. 803–3 showed outstanding qualities. It proved resistant to common scab [*Actinomyces scabies*] and to the races (A, B, C, BC) of late blight [*Phytophthora infestans*] against which it was tested.

Guimaraes (F. F.). **Potato growing in Brazil.**—*Amer. Potato J.*, 30, 5, pp. 124–129. 1953.

In this account of potato cultivation in Brazil the author states that the most important diseases locally are [unspecified] virus diseases, early and late blights [*Alternaria solani*] and (*Phytophthora infestans*) [*R.A.M.*, 34, p. 243], and brown rot [*Pseudomonas solanacearum*: loc. cit.]; the most troublesome are *Phytophthora infestans* and leaf roll virus [17, pp. 57, 131]. Scab [*Actinomyces scabies*: 31, p. 511] is not very common, and ring rot [*Corynebacterium sepedonicum*]. *Fusarium*, and *Verticillium* wilt [*V. albo-atrum*] are virtually unknown. Breeding work is directed mainly at obtaining varieties resistant to *P. infestans*.

Hopkins (J. C. F.). **Diseases of fruit, flowers, and vegetables in Southern Rhodesia. 5. Diseases of Potatoes. (Revised.) Addendum.**—*Rhod. agric. J.*, 50, 1, pp. 87–88, 1953.

In this addition to his revised bulletin [*R.A.M.*, 30, p. 485] the author states that potato blight [*Phytophthora infestans*: loc. cit.] has now become established in Southern Rhodesia and has caught many growers unprepared to meet it. The result has been the complete destruction of many crops at flowering time. In future, all growers will have to allow for the cost of spraying apparatus and fungicides when budgeting for their potato crops. Directions for preparing Bordeaux and Burgundy mixtures are given.

Hiddema (J.) & Kole (A. P.). **Enkele waarnemingen over versmelten van zoösporen bij Phytophthora infestans (Mont.) de Bary.** [Some observations on zoospore fusion in *Phytophthora infestans* (Mont.) de Bary.]—*Tijdschr. PlZiekt.*, 60, 3, pp. 128–139, 4 figs., 1954. [English summary.]

Zoospores of certain strains of *Phytophthora infestans* were observed in studies at the Agricultural College, Wageningen, Holland, to fuse in pairs, the process occurring with particular frequency in isolate (N_2) of the S group [*R.A.M.*, 32, p. 206]. The first step was the formation, generally within half an hour of zoospore discharge, of a connexion between two contiguous zoospores, which gradually became shorter and thicker and within 30 minutes both individuals united into a spherical body. Immediately before fusion was completed the flagella were thrown off. The compound zoospores germinated by means of a germ-tube within half-an-hour of their formation.

Keller (E. R.). **Bemerkungen zum Auftreten der Kraut- und Knollenfäule bei Kartoffeln.** [Notes on the occurrence of haulm and tuber blight of Potatoes.]—*Mitt. schweiz. Landw.*, 2, 11, pp. 181–184, 3 figs., 1954.

Despite progress in cultural methods and breeding, potato blight (*Phytophthora*

infestans) has caused considerable crop losses in Switzerland [*R.A.M.*, 33, p. 316; 34, p. 102] in recent years. Jakobi, reputed to be fairly resistant, was introduced in the Prätigau district in 1953 and grew well there and in Oerlikon until it suddenly collapsed under a blight attack later in the year and in 1954. At the end of July, though Bintje was heavily damaged, Voran and Jakobi seemed to be intact, but by the end of August Jakobi was completely infected and Voran bore some diseased leaves. C. Mastenbroek in Holland diagnosed the presence of races 1, 4, and 1 [33, p. 250].

The effectiveness of breeding for resistance to initial infection by crosses with wild potatoes is queried, as resistance soon breaks down, and attention is drawn to breeding for incubation resistance, that is, for a longer time between infection and sporulation, and particularly for tuber resistance alone, as the haulms of such plants collapse early before much infection has reached the soil and there may be far fewer rotted tubers.

Philippov (A. S.). Влияние пониженных температур на морозостойкость сеянцев Картофеля. [The effect of reduced temperatures on frost resistance in Potato seedlings.]—Агробиология [*Agrobiology, Moscow*], *1954*, 5, pp. 43–49, 1954.

In experiments at the Scientific Research Institute of Potato Cultivation, Malahovka, Moscow district, U.S.S.R., for obtaining frost-resistant potato varieties the selections No. 30/219c/1951 (year), 142/1567c/1952, 4646c/1948, 8131c/1948, and 21655c/1945 proved immune from *Phytophthora* [*infestans*: *R.A.M.*, 33, p. 753 and next abstract].

Ivanchenko (G. Z.). Новые ранние сорта Картофеля, устойчивые против рака и фитофторы. [New early Potato varieties resistant to wart and *Phytophthora*.]—Агробиология [*Agrobiology, Moscow*], *1954*, 5, pp. 50–55, 1954.

Two new potato varieties, 1975c/46 (developed from crosses between Gluksh-piltz and Mihnevsky) and 437c/4 (5419c/44 × Gindenburg), resistant to wart [*Synchytrium endobioticum*: *R.A.M.*, 33, p. 686 and next abstract] and fairly resistant to *Phytophthora* [*infestans*: see preceding abstract] are reported from the Moscow Agricultural Experiment Station of the Pan-Soviet Scientific Research Institute of Alcohol Production, U.S.S.R.

Кекин (А. М.). Повышение устойчивости растений к болезням методом вегетативной гибридизации. [Increasing plant resistance to diseases by the method of vegetative hybridization.] Агробиология [*Agrobiology, Moscow*], *1954*, 5, pp. 37–42, 3 figs., 1954.

In experiments at the Pan-Soviet Scientific Research Station for Potato Wart, U.S.S.R., from 1949 to 1953 the following graft combinations were made in an attempt to produce potato varieties resistant to wart [*Synchytrium endobioticum*: see preceding abstract]: Wohltmann and Ella [? both resistant] grafted on 054 (susceptible) and Ella on 018 and 055 (both susceptible). Grafting was carried out five to seven days after the appearance of the shoots, the scion being cut from a main shoot having two or three leaves. Tests for resistance were started in the second year following grafting. In the fourth year (1953) 054/47, 018/47, 0151/47, and 055/47 were resistant.

De Lint (M. M.) & Obbink (G. J.). **Ontsmettings-proeven tegen de Rhizoctonia-ziekte van de Aardappel.** [Disinfection experiments against the *Rhizoctonia* disease of Potato.] *Landbouwvoorlichting*, 12, 2, pp. 84–88, 1 fig., 1955.

A tabulated survey is given of experiments in the Noordostpolder district of Holland on the control of *Corticium vagum* [*C. solani*] on seed potatoes by five

minutes' immersion in 0·3 per cent. aardisan [*R.A.M.*, 33, p. 753]. The treatment proved very advantageous in the case of heavily infected tubers, not only reducing the numbers of sclerotia in the progeny but slightly raising the yields as compared with those from untreated plants. It should not be applied, however, to tubers which are free from sclerotia, since the results appear to be somewhat harmful.

Hoffmann (G. M.). **Die Schorfresistenzprüfung in Freiland, ihre Möglichkeiten und ihre Anwendung.** [Testing for scab resistance out of doors, its possibilities and application.]—*Züchter*, 24, 1, pp. 11–17, 7 figs., 1954.

Of nine potato varieties inoculated with five physiologic races of *Streptomyces* [*Actinomyces*] *scabies* at the Institute for Phytopathology, Aschersleben, Germany [*R.A.M.*, 33, p. 624], Ackersegen was the most resistant. Races $E_1$16 and $E_2$236 were highly pathogenic to all the varieties tested, while the other three races caused heavier infection on some than on others.

The method used in the trials consisted in growing the tubers first in a cold greenhouse for about three weeks and then transferring to the open under special pots with a hole at one side as well as in the top, the plants being inserted through the former, which was then closed with a bung, and the shoots drawn through the latter; the pots were covered with field soil. The procedure is primarily intended for the preliminary selection of resistant material for breeding and is not designed as a complete substitute for field experiments.

Ludbrook (W. V.) & Brockwell (J.). **The comparative resistance of some Potato varieties to common scab.**—*J. Aust. Inst. agric. Sci.*, 19, 4, pp. 262–264, 1953. [Received 1954.]

In a series of field experiments to compare the resistance of some potato varieties obtainable in Australia to *Streptomyces* [*Actinomyces*] *scabies* [*R.A.M.*, 33, p. 212] under varying climatic and edaphic conditions eight varieties and lines were tested in five States over four seasons from 1947 to 1951. Except in the Tasmanian locality, where the crops are normally heavily infected, the tubers were inoculated, either by dipping in a suspension of the pathogen in skimmed milk or by applying infested soil at planting, the latter method being the more effective. Two methods for estimating scab infection were used [17, p. 766; 18, p. 339].

Although the resistance of some imported varieties was higher than that of Sebago, Late Carman, and King Edward, grown commercially in Australia, it was still insufficient, and the yields of the imported varieties were too low for them to be of use in a breeding programme.

Jetne (M.). **Stilkrôt i potetåkeren.** [Stem rot in the Potato field.]—*Norsk Landbr.*, 21, 3, pp. 51–52, 1955.

Of 560 Up-to-Date potato plants grown from tubers infected by black leg at Tjøtta, Norway, in 1950, only five contracted the disease in the following season, indicating that the risk of transmission from this source is negligible. In the autumn of 1953, 46 out of 100 tubers taken from diseased Jøssing potato plants rotted during storage in a cellar, whereas another 100 from healthy plants remained sound. There were no signs of infection in the field in the progeny of either the 100 rotten or the 100 healthy tubers up to August, 1954, and on lifting at the end of September only three plants were found to be diseased, two from the infected lot and one from a sound tuber. Continuous cultivation of potatoes in the same field year after year does not appear to increase the incidence of black leg, and conversely, the disease may assume a severe form after a lengthy rotation with other crops.

Intensive studies by Jean F. Malcolmson in England are reported to have shown

that two organisms are concerned in the etiology of stem rot, *Bacterium carotovorum* [*Erwinia carotovora*] and *B. atrosepticum* [*E. atroseptica*], the former maintaining itself with carbon dioxide as the sole source of carbon and consistently developing in field crops as a sequel to mechanical injury. It is, therefore, presumed to be an occupant of the soil, whereas *E. atroseptica* appears to be carried by seed potatoes. Heavy infection in wet patches in the field is attributed to the penetration of *E. carotovora* through the lenticels of the root system, causing such rapid decay of the tubers that there is little likelihood of their utilization for seed.

In Norway the limit of black leg in potato stands intended for certification is 1·5 per cent.

Hooker (W. J.) & Peterson (L. E.). **Controlling soil pox in Sweet Potatoes.**—*Iowa Fm Sci.*, 7, 8, pp. 20–144–21–145, 5 figs., 1953.

Soil pox caused by [unspecified] bacteria is the most serious disease of sweet potatoes in Iowa, being particularly prevalent on the sandy soils in the south-east near Muscatine, Fruitland, and Conesville. Many fields were abandoned in 1946 because of severe infestation. Experiments from 1947 to 1949 demonstrated that adjustment of the soil reaction to pH 4·5 to 5·5 by applying 800 lb. sulphur per acre gave good control, although such soils might be too acid for other rotation crops.

Jodon (N. E.). **Breeding for improved varieties of Rice and other cereal grains.**—*Rice J.*, 57, 5, pp. 32–36, 1954.

In investigations at the Rice Experiment Station [Louisiana] during 1953 the resistance of selection 44 C 507 (Rexoro-Purpleleaf × Magnolia) to *Cercospora* leaf spot [*C. oryzae*: *R.A.M.*, 32, p. 449] was greater than that of Zenith or Magnolia. Backcross selection 450 15/16 Rex–3–22 (Rexoro^4 × Blue Rose) is very similar to Rexoro except that it carries resistance to leaf spot.

Ponnamperuma (F. N.), Bradfield (R.), & Peech (M.). **Physiological disease of Rice attributable to iron toxicity.**—*Nature, Lond.*, 175, 4449, p. 265, 1955.

In the course of an investigation in the Department of Agronomy, Cornell University, Ithaca, New York, on the influence of the intensity of reduction of a submerged soil on the growth and yield of rice, it was observed that, five weeks after transplanting in submerged soil in pots, plants receiving three of the 27 treatments exhibited browning symptoms strongly suggestive of a widespread rice disorder known by various names, including mentek [*R.A.M.*, 33, p. 558], and generally ascribed to potassium deficiency [cf. 33, p. 559]. However, in view of the high initial level of exchangeable potassium in these experiments the deficiency may be excluded as the direct cause. There was a close relation between the severity of the disorder and concentration of reduced products, particularly ferrous iron, in the soil percolates analysed at various stages in the growth of the plants. No symptoms occurred on plants given adequate drainage or a high initial concentration of nitrate, or when submergence was delayed, or sodium nitrate was added to retard the reduction process. Furthermore, the condition in the field affects only lowland rice and is associated with very poor drainage and prolonged submergence prior to planting. It is suggested, therefore, that remedial measures should be directed towards reducing the accumulation of ferrous iron.

Straighthead—a common disease in Rice.—*Rice J.*, 57, 8, pp. 17–18, 1954.

The results are presented of an experiment investigating the relative incidence of rice straighthead disease [*R.A.M.*, 21, p. 128] on continuously flooded and drained land, carried out by the Texas Rice-Pasture Experiment Station during 1953. The susceptible varieties, Zenith, Century Patna 231, and Improved Bluebonnet,

yielded on an average 20·23, 19·16, and 20·78 barrels per acre, respectively, on drained ground and 1·01, 0·6, and 4·44 barrels, respectively, on continuously flooded ground. At the same time the resistant varieties Century Patna and Bluebonnet 50 produced 21·51 and 22·54 barrels, respectively, on drained ground and 18·42 and 11·7 on the flooded area. Thorough soil drainage is thus an important factor in the control of straighthead.

CARPENTER (J. B.). **An epidemic of Phytophthora leaf fall of Hevea Rubber trees in Costa Rica.**—*Phytopathology*, 44, 10, pp. 597–601, 2 figs., 1 diag., 1954.

During an epiphytotic of pod rot and leaf fall (*Phytophthora palmivora*) in a planting of five- and six-year-old *Hevea* rubber trees in Costa Rica [*R.A.M.*, 34, p. 177], the progressive development of defoliation was measured by means of periodical counts of fallen leaves at 41 uniformly distributed 1 m.-sq. leaf-collecting stations. The loss of branch wood, reckoned in linear metres, and the number of terminal shoots killed were determined for 22 trees at 12 representative stations.

From 23rd July to 25th August, 1953, when the disease was at its height, cumulative defoliation amounted to 615,500 leaves per ha., representing 2,565 kg. fresh material. The maximum daily rate of fall was 30,000 leaves or 126 kg. per ha. for a six-day period. In some instances loss of branch wood was computed at over 100 linear m. per tree and was accompanied by a correspondingly heavy reduction of the terminal shoots bearing the bulk of the foliage. Pod rot was responsible for the loss of many thousands of seeds intended for the establishment of nurseries.

NORMAN (J. B.). **Molybdenum deficiency in Maize and other crops in the Taree district.**—*Agric. Gaz. N.S.W.*, 64, 8, pp. 422–424, 1953.

Maize and cucumber crops in the Lorne, Stewarts' River, and Hannam Vale areas of New South Wales developed severe molybdenum deficiency symptoms during the 1952–3 growing season [cf. *R.A.M.*, 31, p. 104], this being the first report of the disorder in these areas, and the first record in maize in the State. Affected maize fields contained scattered healthy plants, but the majority were stunted and yellowish, the lower leaves being scorched. Crude sodium molybdate at 5 oz. per acre, mixed with fertilizer and applied with Ensign seed, gave almost 100 per cent. healthy plants compared with 10 per cent. in untreated plots, the treated maize tasselling a week earlier. Improvements were also observed in stunted rock melon and cucumber plants and in the leaf colour of pumpkins after treatment with weak sodium molybdate solution.

HUTSON (W. J.) & CRADDOCK (F. J.). **Major and minor elements deficiencies in pastures and crops in New South Wales.**—*Agric. Gaz. N.S.W.*, 64, 9, pp. 456–459, 474–475, 7 figs., 1953.

The role in plant nutrition of the major and minor elements necessary for growth, including phosphorus [*R.A.M.*, 32, p. 563], nitrogen [loc. cit.], potassium [loc. cit.], calcium [31, p. 117], magnesium [24, p. 459], and sulphur [32, p. 563], is discussed and their deficiency symptoms in various crops are described. In New South Wales deficiencies of phosphorus and nitrogen are widespread and of potassium rare; calcium deficiency occurs in coastal areas and isolated regions on the tablelands, magnesium in some coastal areas, and sulphur on the northern and southern tablelands.

HOLLEY (R. W.) & CAIN (J. C.). **Accumulation of arginine in plants afflicted with iron-deficiency type chlorosis.**—*Science*, 121, 3136, pp. 172–173, 1955.

Analyses conducted at the New York (Geneva) Agricultural Experiment Station, of chlorotic and green blueberry (*Vaccinium* sp.), apple, and *Magnolia stellata* leaves indicated that an accumulation of free arginine is characteristic of the nitro-

gen metabolism of plants affected with iron-deficiency chlorosis [*R.A.M.*, 24, p. 20; 34, p. 231]. During recovery, following treatment with ferrous ethylene diamine tetra-acetate [loc. cit.], the free arginine disappears.

FARROW (W. M.). **Tropical soil fungi.**—*Mycologia*, 46, 5, pp. 632–646, 1954.

A preliminary report is presented on some fungi isolated from 31 samples of soils taken in six major areas in the Panama Canal Zone and Costa Rica. In all, 135 species were identified, of which 100 were imperfect fungi. The commonest genera [cf. *R.A.M.*, 34, p. 179] were (in descending order of prevalence) *Penicillium*, *Aspergillus*, *Fusarium*, *Cunninghamella*, *Trichoderma*, *Absidia*, *Chaetomium*, *Acrostalagmus*, and *Gliocladium*. The soils which were low in humus contained high numbers of *Penicillium* and *Aspergillus*. Certain Mucorales, such as *Absidia* and *Cunninghamella*, were encountered in all soils more frequently than *Mucor* or *Rhizopus*, and 17 species of *Aspergillus* were obtained.

Of the fungi listed mention may be made of *Botryodiplodia theobromae* from Barro Colorado Island and Canal Zone, *Curvularia lunata* and *Hormodendrum* [*Cladosporium*] *cladosporioides* from Barro Colorado and Puerto Armuelles, Costa Rica, *Fusarium solani* from all areas, *Rhizopus nigricans* [*R. stolonifer*], once only, from Barro Colorado, *Trichoderma lignorum* [*T. viride*] from most localities, and *Thielaviopsis basicola* from Barro Colorado and Costa Rica. No basidiomycetes were isolated. One colony of *Coemansia reversa*, very rarely recorded from soil, was obtained.

BAKERSPIGEL (A.). **A further report on the soil storage of fungi.**—*Mycologia*, 46, 5, pp. 680–681, 1954.

In further studies at the Provincial Laboratory of Public Health, University of Alberta, Edmonton, Canada [*R.A.M.*, 33, p. 318], 94 stock cultures of fungi were stored in loam for two years, with agar cultures as controls.

In loam all the fungi [in this and the previous study] except *M*[*icrosporum*] *audouini* and *Candida albicans* were viable. These results confirm the earlier finding that loam is a useful storage medium for fungi, since most species can be preserved in it in their 'wild' state for periods of up to 5½ years.

KALYANASUNDARAM (R.). **Soil conditions and root diseases. XII. The role of zinc and manganese in altering host metabolism.**—*J. Indian bot. Soc.*, 33, 3, pp. 197–202, 1 diag., 1 graph, 1954.

In a further contribution to this series [cf. *R.A.M.*, 34, p. 226] the effect of zinc and manganese [33, p. 259] on the susceptibility of the cotton variety Karunganni 2 (*Gossypium arboreum*) to *Fusarium vasinfectum* [33, p. 248] was studied in pot experiments at the Botany Laboratory, Madras University. The addition of zinc caused an increase in the ascorbic acid and carbohydrate content, possibly through an increase in auxin production, and correspondingly raised the resistance to *F. vasinfectum*, almost to the degree of a resistant variety.

MUNNECKE (D. E.) & LINDGREN (D. L.). **Chemical measurements of methyl bromide concentration in relation to kill of fungi and nematodes in nursery soil.** *Phytopathology*, 44, 10, pp. 605–606, 1 graph, 1954.

The results of further experiments on the control of various fungi in a Californian nursery soil at 67° to 70° F. by means of 24 hours' fumigation with gaseous methyl bromide at the rate of 4 lb. per 100 cu. ft. space confirmed those already described in respect of the resistance of *Verticillium albo-atrum* to this mode of treatment [*R.A.M.*, 33, p. 259]. The percentages of survival of the microsclerotia on sterile tomato stems [33, p. 508; and above p. 308] and of the fungus in soil samples were 25 and 80, respectively. Under identical conditions *Sclerotinia sclerotiorum*,

Sclerotium delphinii, *Pythium* sp., *Rhizoctonia* [*Corticium*] *solani*, and *Fusarium oxysporum* f. *gladioli* succumbed completely.

Norton (D. C.). **Antagonism in soil between Macrophomina phaseoli and selected soil-inhabiting organisms.**—*Phytopathology*, 44, 9, pp. 522–524, 3 diags., 1954.

At the Texas Agricultural Experiment Station *Macrophomina phaseoli* was paired at opposite ends of soil columns with *Aspergillus flavus*, *A. rugulosus*, *A. terreus*, *Thielavia terricola*, *Trichoderma lignorum* [*T. viride*], and *Bacillus cereus*, isolated by the Warcup method [*R.A.M.*, 29, p. 530] over a one-year period from a field in which charcoal rot of guayule [*Parthenium argentatum*: 33, p. 446] had been severe.

The growth of *M. phaseoli* was inhibited by all the other organisms in sterile soils with or without amendments, but *T. viride* and *Thielavia terricola* were the only species to invade the colony of the charcoal rot fungus to any extent. The only fungus that penetrated for an appreciable distance into non-sterilized soil was *Trichoderma viride*. The hyphae of all species lost vigour rapidly, and except for *A. terreus* decreased in visible numbers after the invasion of any given area, whether growing alone or paired in sterile soils.

All the fungi except *M. phaseoli* sporulated profusely in sterile soil. Spore production by *T. viride* and *Thielavia terricola* was not perceptibly reduced when these species invaded a colony of *M. phaseoli*.

Wilson (K. S.). **The fate of Verticillium albo-atrum R. & B. in muck soil as affected by various species of fungi.**—*Diss. Abstr.*, 14, 10, p. 1516, 1954.

The microflora of muck soil sterilized by the steam under pressure and intermittent steam methods at Purdue University, Lafayette, Indiana, contained numerous fungi antagonistic to isolates of *Verticillium albo-atrum* [*R.A.M.*, 32, pp. 90, 688], soils from fields planted with maize, oats, and certain other crops containing more than soil from a field of peppermint. Of 62 out of 268 organisms shown to be inhibitory to the isolates by the 'T' streak method 35 were markedly antagonistic. The metabolic products from 16 of these were also active against *V. albo-atrum*. A variation of the Audus-type percolator demonstrated that 10 out of 16 organisms were moderately to highly inhibitory to *V. albo-atrum* No. 9 and that certain fungi can produce a substance or substances in sterilized muck antagonistic to *V. albo-atrum*. Of eight antibiotics assayed against three isolates of *V. albo-atrum* rimocidin and chloromycetin [chloramphenicol] were the most effective. *V. albo-atrum* readily colonized sterilized muck soil but was a poor competitor. However, as it did not grow saprophytically in unsterilized muck soil it must be considered as a soil invader.

Rimocidin [31, p. 395] was demonstrated in the greenhouse to be a protectant antibiotic reducing the incidence of *V. albo-atrum* No. 9 in tomatoes. It was stable in muck soil, non-phytotoxic to tomatoes at a concentration of 10 μgm. per ml., and effected control in 63 per cent. of the cases at this concentration. In greenhouse trials 16 fungi were antagonistic to *V. albo-atrum* No. 9 on tomato: *Streptomyces* W-32, *Fimetaria* sp., *Podospora* sp., *Chaetomium* sp., and *Stachybotrys alternans* gave complete control but *Penicillium urticae* and *Aspergillus clavatus* enhanced symptom expression. There was an excellent correlation between the amount of inhibition exhibited in the Audus percolator assays and the results in the greenhouse trials.

Dölle (H.). **Über antibiotische Wirkungen von Actinomyceten des Bodens auf Helminthosporium papaveris Saw.** [On the antibiotic effects of soil actinomycetes on *Helminthosporium papaveris* Saw.]—*Zbl. Bakt.*, Abt. 2, 108, 4–7, pp. 127–133, 6 figs., 1954.

Grümmer has demonstrated (Thesis, University of Jena, 1950) in Germany that

Helminthosporium papaveris [*Pleospora calvescens* or *P. papaveracea*], the agent of poppy blight, can lead a saprophytic existence in sterile field soils [*R.A.M.*, 32, p. 539] and can be reisolated from them but not from unsterilized soils. His observations were confirmed by Lange (Thesis, Jena, 1953), and further studies by Taubeneck (*NachrBl. dtsch. PflSch Dienst, Berl.*, 8, 3, 1954) showed that the suppression of the pathogen in natural soils may be effected by strains of *Streptomyces* from forest soils.

In the author's streak tests 34 out of 86 actinomycetes isolated from the soil of an opium poppy field at the Biological Institute, Naumburg, were active to highly active against *P. papaveracea*. It is emphasized, however, that these findings may not be universally valid and that no claim can be made, pending further studies, for the invariable freedom of field soils from contamination.

Calvert (O. H.) & Thomas (C. A.). **Some factors affecting seed transmission of Safflower rust.**—*Phytopathology*, 44, 10, p. 609, 1954.

Temperature appears to be a critical factor in the transmission of safflower rust (*Puccinia carthami*) [*R.A.M.*, 33, pp. 50, 260, 262]. In greenhouse tests the incidence of infection in seedlings of the N8 (Nebraska) variety produced from seed heavily inoculated with teleutospores and planted in steamed soil averaged 5 per cent. at 20° to 24° C. and 90 at 5° to 15°; negative results were obtained with uredospores at both air temperatures. In further experiments in constant temperature chambers inoculated seed of the same variety was grown in steamed soil at 5°, 10°, 15°, and 20° for a week, after which all the temperatures were raised to 22° for a month. In two tests the average infection at the four original temperatures was 96·1, 76·2, 67·3, and 29·3 per cent., respectively. In six varietal reaction tests, again at 5° for a week and 22° for a month, N8 was the most susceptible with 51·2 per cent. infection, followed by N6, N10, and W.O.14, with 32·5, 21·6, and 0, respectively.

To verify the observations of Prasada and Chothia in India regarding the varying periods of viability of two different types of teleutospores [29, p. 534], material collected in the field in Arizona [32, p. 100] on 23rd June, 1953, was sent to the Field Crops Research Branch, Beltsville, Maryland, and stored in a refrigerator at 2°. In tests similar to the foregoing during July and August over 90 per cent. infection developed in N8 plants inoculated with these teleutospores. In September and October the incidence fell to less than 1 per cent., but it rose again in three tests during November to an average of 38 per cent. Spores removed from the refrigerator in October and held at 25° for a month produced an average of 81·1 per cent. rust in two experiments.

N8 seed harvested from diseased plants in Nebraska in the autumn of 1950 gave rise to 20 per cent. rusted seedlings in tests performed within two months at the Texas Agricultural Experiment Station. In the spring of 1952, 1 per cent. of the plants grown from the same seed lot, which in the meantime had been stored in an unheated building, contracted infection by *P. carthami*, thereby demonstrating the persistence of viability in some of the spores.

Orian (G.). **La maladie de Fidji à Madagascar.** [Fiji disease in Madagascar.]—*Rev. agric. Maurice*, 33, 3, p. 123, 1954.

This report on Fiji virus disease of sugar-cane has already been noticed [*R.A.M.*, 34, p. 107].

Orian (G.). **Sclerospora disease of Sugarcane in Mauritius.**—*Rev. agric. Maurice*, 33, 2, pp. 64–73, 3 pl., 1954.

An outbreak of sugar-cane *Sclerospora* disease (*S.* ? *macrospora*) [*R.A.M.*, 34, p. 107] occurred in 1953 on the M. 134/32 variety in the Plaines Wilhems district of

Mauritius. The disease, though not previously recorded on the island, is believed to have been present for a long time on sugar-cane though not sufficiently widespread to be noticed. It is not expected to be of economic importance. Measures recommended for checking its spread include the immediate destruction of all infected stools, the rejection of cuttings from affected fields for replanting, and proper drainage of low-lying areas in such fields.

JOSHI (N. C.). **Fighting wilt disease of Sugarcane in Uttar Pradesh (India).**—*Sci. & Cult.*, 20, 6, pp. 301–302, 1954.

Notes are given on the suggested control measures against sugar-cane wilt (*Cephalosporium sacchari*) [? and *Gibberella fujikuroi*: *R.A.M.*, 33, p. 381] which is reported to be causing damage to canes harbouring borers in Uttar Pradesh, India. All the infected plants or parts thereof should be burnt, ratooning stopped, a three-year crop rotation introduced, and resistant varieties Co. 109, Co. 393, Co. 356 [28, p. 5], and Co. 76 grown. Planting should be restricted to higher fields and ploughing done before the hot season so that the fungus is exposed to the sun and killed; heavy manuring of the fields is recommended. Acidification of the soil should be encouraged and planting on calcareous soil avoided.

GREENE (H. C.). **Notes on Wisconsin parasitic fungi. XX.**—*Trans. Wis. Acad. Sci. Arts Lett.*, 43, pp. 165–181, 1954.

In this further annotated report on Wisconsin parasitic fungi [cf. *R.A.M.*, 33, p. 184] collected during 1952 and 1953, *Zythia fragariae* is tentatively identified on *Fragaria virginiana*. Among the new host records for the State are *Plasmopara halstedii* on *Cacalia suaveolens*, *Elsinoe veneta* on *Rubus allegheniensis*, and *Lophodermium juniperinum* on *Juniperus chinensis* var. *pfitzeriana*. New fungus records include *Septoria gladioli* on gladiolus and *Botrytis tulipae* on tulip. Among the four new species described are *Phyllosticta succinosa* with subglobose pycnidia, 75 to 160 (mostly 100) μ in diameter, and hyaline, subcylindric conidia 4 to 7 by 2·5 to 3 μ, on *Ribes americanum*, and *Alternaria inconspicuum* with sooty-olivaceous, non-catenulate, 4-celled, rarely muriform conidia, 14 to 22 by 6 to 8 μ, cylindrical, sometimes ovoid or obovoid, the basal cell obconic with a truncate spore scar, on ash (*Fraxinus pennsylvanica* var. *lanceolata*).

HENNEN (J. F.). **A monograph of the Uredinales occurring on the grasses of the tribe Chlorideae throughout the world.**—*Diss. Abstr.*, 14, 10, p. 1512, 1954.

The author redefines and redescribes 19 species of *Puccinia* and eight of *Uromyces* attacking grasses of the tribe Chlorideae throughout the world but chiefly in the tropics and subtropics of Africa and North and South America [cf. *R.A.M.*, 30, p. 420]. One species of each genus is described as new [but these are not yet effectively published, see Article 39 of the International Rules].

CIFERRI (R.). **A subgeneric subdivision of the genus Ustilago Rouss. ex Pers.**—*Atti Ist. bot. Pavia*, Ser. 5, 10, pp. 99–104, [1952].

The author critically summarizes the history of the genera *Ustilago*, *Sphacelotheca*, *Cintractia*, and *Sorosporium* and gives notes on spore development. He confirms the unity of the genus *Ustilago* and disagrees with splitting it into *Cintractia* and *Sphacelotheca*. The genus *Sorosporium* is retained typically for smuts on members of the Caryophyllaceae. The smuts with labile spore-balls on graminaceous species are placed in one of eight subgenera into which the author divides *Ustilago*.

HANSFORD (C. G.). **Meliolales from Indonesia.**—*Reinwardtia*, 3, 1, pp. 75–112, 1954.

The 134 species dealt with in this paper form the major part of a collection

received from the Herbarium Bogoriense, Bogor, Indonesia, and include most of the Meliolaceae previously recorded from Java [cf. *R.A.M.*, 15, p. 398] plus descriptions of 39 new species and 13 new varieties.

Hansford (C. G.). **Some Microthyriales and other fungi from Indonesia.**—*Reinwardtia*, 3, 1, pp. 113–144, 1954.

This further contribution to the fungi of Indonesia [see preceding abstract] contains descriptions of 56 species (chiefly Microthyriales), 38 of them new, and nine new combinations.

Zogg (H.). **Über eine neue Hysteriaceen-Art, Lophium elegans n.sp.** [On a new species of Hysteriaceae, *Lophium elegans* n.sp.]—*Ber. schweiz. bot. Ges.*, 64, pp. 139–141, 1 fig., 1954.

A technical diagnosis is given of *Lophium elegans* n.sp., found on living branches of *Juniperus nana* at an altitude of 1,400 m. above sea-level near Bolzano, south Tyrol, Italy. The black, carbonaceous, shell- or hatchet-shaped perithecia measure 150 to 400 (average 250 to 350) by 190 to 320 (230 to 260) by 50 to 150 (100 to 130) μ; the long cylindrical or slightly clavate asci 150 to 210 (180 to 200) by 6 to 7 μ; and the filiform, hyaline to faintly yellow, multiseptate ascospores 200 to 300 (260 to 280) by 2 μ.

Săvulescu (T.) & Săvulescu (Olga). **Studiul morfologic, biologic și sistematic al genurilor Sclerospora, Basidiophora, Plasmopara și Peronoplasmopara.** [Morphological, biological, and systematic studies on the genera *Sclerospora*, *Basidiophora*, *Plasmopara*, and *Peronoplasmopara*.]—Academy of the Rumanian People's Republic, pp. 327–457, 53 figs., 19 graphs, [? 1952. French and Russian summaries].

A study was made of the Peronosporaceae of Rumania [cf. *R.A.M.*, 29, p. 336], using statistical methods as well as experimental inoculations. The genus *Sclerospora* is represented in Rumania by *S. graminicola* on *Setaria italica* and *S. viridis*, and the genus *Basidiophora* by *B. entospora* on *Erigeron canadensis*.

A key is given for the identification of 24 species of *Plasmopara*, of which 19 are new segregates from other species, including *P. anemones-ranunculoidis* on *Anemone ranunculoides* (conidia 21 by 19 μ), *P. anemones-nemorosae* on *Anemone nemorosa* (24 by 21 μ), *P. hellebori-purpurascentis* on *Helleborus purpurascens* (27 by 20 μ), and *P. isopyri-thalictroides* on *Isopyrum thalictroides* (17 by 20 μ), all split off from *P. pygmaea*. *P. pusilla* on *Geranium* spp. is subdivided into *P. geranii-pratensis* (conidia 27 by 21 μ) and *P. geranii-silvatici* (21 by 18 μ). *P. nivea* has been split into 15 species, of which ten are new; those on economically important hosts are *P. dauci* on carrot (21 by 18 μ), *P. pastinacae* on parsnip (19·5 by 18 μ), *P. petroselini* on parsley (24 by 18 μ), and *P. apii* on celery (18 by 15 μ).

P. viticola [31, p. 167] is divided into three forms, *P.v.* f. *viniferae-ampelopsidis*, *P.v.* f. *silvestris*, and *P.v.* f. *aestivalis-labruscae*, on the basis of host range.

It is considered that *P. halstedii* [C.M.I. map No. 286] should be subdivided into *P. megasperma* on *Scorzonera humilis* (32·96 by 21·32 μ), and *P. sphaerosperma* on *Tragopogon* spp. (28·5 μ diameter). In many herbaria collections of *P. sphaerosperma* have been found under *Bremia lactucae*.

Species of *Pseudoperonospora* found in Rumania include *P. cannabina* on hemp, *P. cubensis* [No. 285] on cucurbits and *P. urticae* on *Urtica* spp.

Putterill (K. M.). **Some graminicolous species of Helminthosporium and Curvularia occurring in South Africa.**—*Bothalia*, 6, 2, pp. 347–378, 20 figs., 1954.

Eighteen species of *Helminthosporium* and two of *Curvularia*, found on cereals

and grasses in South Africa, are described. Included are *H.* (*Pyrenophora*) *teres* causing net blotch on barley [*R.A.M.*, 12, p. 163], common wherever the crop is grown, the perithecia not yet having been recorded in South Africa, and *H. gramineum* (*P. graminea*), not generally serious, causing leaf stripe and, under certain conditions, foot-rot of barley [10, p. 373], and also isolated from wheat, oats, and maize. *H. sativum*, common on wheat [24, p. 402] and barley [20, p. 150], was also isolated from oats and wild grasses. On wheat the fungus causes spot blotch of the leaves, particularly in the summer rainfall areas; a more destructive foot rot is often attributable to the combined action of *H. sativum* and other fungi, such as *Fusarium arenaceum* and *C. spicifera*. *H. bicolor* [cf. 32, p. 118], *H. halodes* [cf. 16, p. 735], and *H. rostratum* [cf. 26, p. 337] were also isolated from foot-rotted wheat plants, and *H. bicolor* was found on the leaves of *Sorghum halepense* and *S. verticiflorum*, sometimes in association with *H. turcicum*. Severe losses of maize in Natal are caused by *H. turcicum* [31, p. 536], which also destroyed entire plantings of *S. sudanense* [18, p. 438] at Prinshof, Pretoria, during the summers of 1937–9. *H. cynodontis* is reported to be fairly common on *Cynodon dactylon* [12, p. 163] and *C. bradleyi* in the Transvaal and on *C. dactylon* in the Eastern Cape Province. During the wet seasons in February and March the fungus was abundant in brown patches on lawns. *H. brizae* occurred on *Briza maxima* [cf. 8, p. 530]. *H. sacchari* on sugar-cane [23, p. 149] is most prevalent in cool, damp weather, but not serious. *H. dematioideum* is believed to be common as a saprophyte or a weak parasite on *C. transvaalensis*, *C. bradleyi*, and *C. dactylon*, frequently occurring with *H. cynodontis* and species of *Curvularia* and occasionally with *Rhizoctonia*. *C. spicifera*, occurring on wheat [cf. 33, p. 21], oats, barley, rye, and rice [cf. 19, p. 258] affected by foot rot, was also found on withered leaves and stems of *Cynodon transvaalensis*. *Curvularia ? lunata* was isolated from foot-rotted wheat in association with other fungi; it may be a secondary invader.

Luttrell (E. S.). **A taxonomic revision of Helminthosporium sativum and related species.**—*Amer. J. Bot.*, 42, 1, pp. 57–68, 31 figs., 1955.

As a result of a comparative study of type specimens at the Georgia Experiment Station, Experiment, and of morphological, cultural, and pathological studies of fresh collections, *Helminthosporium sativum*, *H. acrothecioides*, and *H. californicum* are reduced to synonymy with *H. sorokinianum*. The species is characterized by broad, straight, ellipsoid to fusoid, thick-walled, dark olivaceous-brown conidia. Deviating types found in the field assumed these common characteristics in culture and are considered growth forms. There are several strains differing in pathogenicity on various cereals and grasses. *H. victoriae* infecting oats and *H. setariae* on *Setaria* spp. have narrower, more often curved, and paler-coloured conidia; they are morphologically alike but separated from each other on the basis of pathogenicity. Both are more closely related to species in the *H. oryzae-sacchari* group than to *H. sorokinianum*.

Van Vloten (H.) & Gremmen (J.). **Studies in the Discomycete genera Crumenula de Not. and Cenangium Fr.**—*Acta bot. neerl.*, 2, 2, pp. 226–241, 6 figs., 2 pl., 1953. [Received 1954.]

After reviewing the literature the author comes to the conclusion that the species *Crumenula pinicola* and *C. sororia* [*R.A.M.*, 25, p. 587] are specifically distinct, though showing great similarity in apothecial structure, whereas *C. abietina* [loc. cit. and 31, p. 516] and *C. laricina* have more affinity with *Scleroderris*, and are accordingly transferred as *S. abietina* n.comb. and *S. laricina* n.comb.

The literature on the genus *Cenangium* is discussed. Cultural studies indicated that *C. ferruginosum* [32, p. 598] always produced black spermogonia with bacilli-

form, hyaline spermatia, while *Encoelia fascicularis* formed shiny sporodochia. Furthermore, species of *Encoelia* grow more quickly *in vitro* than those of *Cenangium*, so for the time being both names are maintained.

A diagnosis is given of the previously undescribed pycnidial stage of *Crumenula sororia*, which seems related to the genus *Sirothecium* and for which the name *Digitosporium piniphilum* Gremmen n.gen. n.sp. is proposed. The type species was collected on branches of pine (*Pinus sylvestris*) and produces more or less globular, black pycnidia (3·5 to 8 μ in diameter), growing in groups or singly in the substratum. They open by rupturing, a feature placing them in the Excipulaceae. The conidium, which resembles the fingers of a hand, consists of a main branch of seven to nine cells, mostly carrying one to four secondary branches, and is shed from a subhyaline tissue forming the inner wall of the pycnidium. The cells forming the conidium have thick walls and measure 5·5 to 5·7 by 3·5 to 3·8 μ. In Holland *C. sororia* always occurs on resinous cankers on the stems and branches of *P. nigra* var. *austriaca* and *P.n.* var. *corsicana* as well as on *P. sylvestris*.

S. abietina Gremmen comb.nov. (syn. *C. abietina*) was found on dying twigs of *P. nigra* var. *austriaca* in Holland during 1949. Cultures from ascospores produced characteristic pycnidia and pycnidiospores, considered to be *Brunchorstia pinea* [cf. 25, pp. 283, 587], while the mycelium varied from green via yellow-green to greyish green.

S. laricina comb.nov. (syn. *C. laricina*) [25, p. 587] is known only in Switzerland.

Inoculation experiments with *Cenangium ferruginosum* [31, p. 516] indicated that this fungus is a saprophyte, since wounds treated with a pure culture gave a negative result. Wound inoculations with *Crumenula sororia* were successful on *P. sylvestris*, *P. nigra* var. *austriaca*, and *P.n.* var. *corsicana*. With *S. abietina* 42 to 70 per cent. of the inoculations on *P. nigra* var. *corsicana* succeeded, but not on the other two species of pine.

MacLeod (D. M.). **Investigations on the genera Beauveria Vuill. and Tritirachium Limber.**—*Canad. J. Bot.*, 32, 6, pp. 818–890, 3 pl., 9 figs., 1 map, 1954.

A thorough review of the literature revealed that 32 named species have been involved in the genera *Beauveria* and *Tritirachium* [*R.A.M.*, 28, p. 348]. The cultural characters hitherto taken as the criteria for distinguishing alleged *Beauveria* spp. are not sufficiently outstanding or prominent on which to establish species. Furthermore they are unstable and can be changed simply through monospore culturing or by transferring cultures from one type of medium to another.

A general investigation at the Laboratory of Insect Pathology, Sault Ste. Marie, Ontario, of the cultural and morphological characters of *Beauveria* isolates from 70 insect and four rodent species disclosed that *B. bassiana* [31, p. 552] and *B. tenella* are the only species warranting specific status and therefore *B. stephanoderis*, *B. laxa*, *B. globulifera*, *B. effusa*, *B. vexans*, *B. doryphorae*, *B. delacroixii*, and *B. acridiorum* are regarded as strains of *B. bassiana*; and *B. densa*, *B. melolonthae*, *B. brongniartii*, and *B. shiotae* of *B. tenella*. *T. dependens*, *T. album* [31, p. 634], *T. spicatum*, *T. oryzae*, *T. heimii*, *T. brumpti*, *T. musae*, *T. purpureum*, *T. cinnamomeum*, and *T. roseum* are characteristic of *Tritirachium*. The genus of '*T. epigaeum*' is uncertain. *B. peteloti*, *B. rileyi*, *B. paranense*, *B. coccorum*, *B. coccospora*, *T. rubrum*, and *T. viannai* are not characteristic of either genus and are placed elsewhere. Species of *Beauveria* appear to be primarily parasitic on insects and species of *Tritirachium* primarily saprophytic.

Chessin (M.) & Scott (H. A.). **Mineral nutrition and the size of local lesions induced by Tobacco mosaic virus.**—*Science*, 121, 3134, p. 112, 1955.

Experiments were carried out from 1952 to 1954 during different seasons of the year, at the Department of Botany, Montana State University, Missoula, on the

influence of normal and deficient mineral nutrition upon the susceptibility of *Nicotiana glutinosa* to tobacco mosaic virus [cf. *R.A.M.*, 31, p. 317; 33, pp. 204, 583]. In each experiment every plant was inoculated with the virus after characteristic deficiency symptoms had developed. Calcium and magnesium deficiencies had no apparent effect on the size of local lesions that subsequently developed, though the consistent effect of iron and sulphur deficiencies was to induce lesions two to three times as large as those on the controls.

Allington (W. B.) & Laird (E. F.). **The inhibitive effect of water on infection by Tobacco mosaic virus.**—*Phytopathology*, 44, 9, pp. 546–548, 1954.

At the Nebraska Agricultural Experiment Station dipping rubbed leaves in water before inoculation was found to inhibit the infection of *Nicotiana glutinosa* by tobacco mosaic virus [cf. *R.A.M.*, 34, p. 110], thereby confirming the results of earlier work by Yarwood [31, p. 317]. The nature of the inhibitory effect, which persists for at least 24 hours, is unknown.

Powers (H. R.). **The mechanism of wilting in Tobacco plants affected by black shank.**—*Phytopathology*, 44, 9, pp. 513–521, 3 figs., 1954.

This is an amplified account of studies at the North Carolina State College, Raleigh, on the mechanism of wilting in tobacco plants infected by *Phytophthora parasitica* var. *nicotianae*, a note on which has already appeared [*R.A.M.*, 31, p. 461]. Tyloses and gums, besides large masses of mycelium, were found in the vessels of diseased tissue, while the lateral movement of water was obviously retarded by the numerous hyphae occupying the vascular ray cells. This condition of the xylem tissues was considered to afford a reasonable explanation of the failure of water passage through the lesions.

Tyloses were formed below cut surfaces of tobacco stem sections immersed in water with the upper ends exposed to air, as well as in diseased plants prevented from wilting by maintenance in a moist chamber. Thus, tylose formation occurred with or without exposure of the vessels to air. Severe wilting, accompanied by tylose and gum formation, developed in excised, healthy plants placed in extracts of either healthy or diseased plant tissue. These tyloses and gums closely resembled those found in diseased tissue and reacted identically to microchemical tests. Except for the absence of mycelium, it was impossible to distinguish between xylem from a stem treated with extracts and one from a black shank lesion.

It may be concluded from these findings that tyloses and gums are a primary cause of the obstruction of water movement in black shank-diseased plants rather than a result of previous rupture of the water columns. The evidencefurt her indicates that the development of tyloses and gums in the vessels of diseased stems is induced primarily by the toxic effects of decomposition products of the invaded cells. These toxins do not normally extend beyond a restricted area in the xylem, nor are they necessarily products of fungal metabolism since a comparable reaction is incited by cell decomposition products alone.

The results of these studies lend no support to the theory that wilting in black shank is a systemic effect of a toxic metabolic product of *P. p.* var. *nicotianae* [12, p. 793]. The sole explanation permitted by the facts presented is that the loss of turgor is due to the blocking of water movement through the lesions.

Critopoulos (P. D.). **Symptoms on Tomato plants incited by three Phytophthora species.**—*Phytopathology*, 44, 9, p. 551, 1954.

At the Department of Plant Pathology, University of California, detached, unwounded fruits of the Earliana, Stone, Ponderosa, Sutton's Best, and Pearson tomato varieties were inoculated with cultures of *Phytophthora capsici*, *P. drechs-*

leri, and *P. parasitica* [*R.A.M.*, 20, p. 501] and the resultant symptoms compared. Immature green fruits were readily infected by *P. capsici* and *P. parasitica*, but not so readily by *P. drechsleri*. The decay induced by *P. capsici* spread rapidly and the fruits became mummified in about 12 days. Mature fruits were less readily infected by *P. capsici* than by the other two species. Tufts of sporangia were produced on the surface of the infected fruits by *P. capsici* alone.

Bain (D. C.). **Relation of staking and pruning to the incidence of blossom-end rot of Tomatoes.**—*Plant Dis. Reptr*, 38, 10, pp. 721–722, 1954. [Multilithed.]

Observations at the Truck Crops Branch Experiment Station, Crystal Springs, Mississippi, showed that the percentage of blossom-end rot of tomatoes [*R.A.M.*, 32, p. 700; cf. 34, p. 265] was lower on plants not staked and pruned once than on those staked and pruned at least twice, the ratio of diseased fruits on plants in the two categories being, roughly, 1:6 and 1:2 in 1953 and 1954, respectively. Drastic changes in the rate of transpiration of the staked plants due to exposure to sudden and stronger air currents and to reduced mulching and shading of the roots may be responsible for their susceptibility to the disorder.

Biraghi (A.). **Ulteriori notizie sulla resistenza di Castanea sativa Mill. nei confronti di Endothia parasitica (Murr.) And.** [Further notes on the resistance of *Castanea sativa* Mill. to *Endothia parasitica* (Murr.) And.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 11 (*1953*), pp. 149–157, 4 figs., 1954. [English summary.]

Referring to the increasing frequency with which manifestations of apparent resistance to *Endothia parasitica* have been observed in sweet chestnuts in different parts of Italy in recent years [*R.A.M.*, 31, p. 408; 34, p. 113], the author states that this is not, apparently, associated with reduced virulence of the parasite or with environmental conditions. Arrest of the spread of the fungus and its subsequent elimination are due to increased cambial activity, as can be demonstrated by histological examination of the tissues formed during the process of defensive reaction. Similar histological changes occur when the more resistant species *Castanea mollissima* and *C. crenata* are artificially inoculated with *E. parasitica*.

Mańka (K.). **O przebiegu holenderskiej choroby Wiązów (Ceratostomella ulmi (Schw.) Buisman) na terenie miasta Poznania.** [Concerning the spread of Dutch Elm disease (*Ceratostomella ulmi* (Schw.) Buisman) in the Poznań area.]—*Acta Soc. Bot. Polon.*, 22, 2, pp. 355–378, 6 figs., 20 graphs, 1953. [English summary.]

Investigations were carried out from 1946 to 1949, inclusive, on the spread of Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, 16, p. 424] in the Poznań area of Poland. Of the 2,082 trees examined, 511 died from the disease, mortality being highest in *Ulmus montana*, followed by *U. campestris*, and lowest in *U. effusa*, which showed a tendency to recover.

Young (H. C.) & Brandt (W. H.). **Timber decay and deterioration observed in Oak wilt experiments.**—*Fm Home Res.*, 38, 280, pp. 8–9, 1 fig., 1953.

Most of this information on inhibition of the growth of the oak wilt fungus, *Chalara quercina* [*R.A.M.*, 34, p. 192], by *Xylaria multiflex* has already been noticed from another source [33, p. 650].

Converse (R. H.). **Preliminary results in the use of eradicant sprays for Pecan scab control.**—*Plant Dis. Reptr*, 38, 10, pp. 701–704, 1954. [Multilithed.]

Preliminary experiments were conducted in 1953 in a grower's orchard near Paden, Oklahoma, on the use of eradicant sprays for the control of pecan scab (*Cladosporium effusum*) [*R.A.M.*, 33, p. 469] on 21-year-old Squirrel trees. One

application in March, just before bud break, to a tree and to the ground within an area 30 ft. in diameter, of 50 gals. of 80 per cent. monocalcium arsenite (3 lb. per 100 gals. water), followed by five protectant sprays of ziram (2 lb. per 100 gals.) reduced the percentage area scabbed on the shucks of mature nuts in September to 21·4 compared with 47·6 for the protectant alone.

ZOBRIST (L.) & HOLENSTEIN (R.). **Forstlicher Pflanzenschutz.** [Plant protection in the forest.]—*Schweiz. Z. Forstw.*, 105, 5–6, pp. 266–276, 13 figs., 1954.

The principal diseases and pests of forest trees in Switzerland are listed in tabular form, with recommendations for their control, among which may be mentioned seed treatment with 2 to 3 gm. cupromaag per kg. against [unspecified] damping-off fungi, followed after sowing by watering with 0·2 per cent. M 555 at the rate of 4 l. per sq. m. and on the development of symptoms by two to three applications of the same product at fortnightly intervals; spraying with 0·3 per cent. M 555 during May to June against downy mildew [*Phytophthora* spp.] of beech seedlings; spraying with 1 per cent. sofril + 0·1 per cent. etaldyn, also in May to June, against oak mildew [*Microsphaera alphitoides*], or a prophylactic treatment with versol dust may be substituted; M 555 as a dust or spray at 0·2 per cent. against the black snow fungus [*Herpotrichia nigra*: *R.A.M.*, 31, p. 360] to be applied to young spruces and the surrounding soil, especially in nurseries, before the snow falls and after the first thaw; several treatments of trees and soil with M 555 (dust or 0·2 per cent. solution) against leaf fall [*Lophodermium pinastri*]; eradication of any conifers attacked by the honey fungus [*Armillaria mellea*] and replanting with hardwoods; and excision of wounds and painting with proxyl against [unspecified] basal rots following injury to various kinds of trees. Some general directions are given for the choice of spraying or dusting, with a short list of the different types of apparatus obtainable.

BUDDENHAGEN (I.) & YOUNG (R. A.). **A new Phytophthora leaf and twig blight of English Holly in Oregon.** *Plant Dis. Reptr*, 38, 10, pp. 723–724, 2 figs., 1954. [Multilithed.]

A disease of English holly (*Ilex aquifolium*), known for many years but not previously described, is present in Washington State and of major importance in Oregon, where in some coastal orchards up to 80 per cent. of the twigs become completely defoliated and serious twig blight occurs, especially on the lower limbs. The pathogen is a new species of *Phytophthora* related to the *P. syringae* group [cf. *R.A.M.*, 32, p. 315]. Growth occurs in culture from 5° to 20° C. but not at 25°.

The disease is favoured by cool, rainy weather. Black leaf spotting, starting in the lower part of the trees in the autumn and progressing upwards, is followed later in the winter by defoliation, die-back, and canker of the larger branches. In the spring twigs may become girdled at a berry cluster some distance from the tip and killed. Leaves become infected through leaf spine punctures or stomata; twigs are invaded through leaf scars, the fungus penetrating farther into larger branches and causing cankers. Sporangiophores emerge from stomata on the lower leaf surface. Oospores, formed in the leaf spots and in the cortex of diseased twigs, may serve as means of oversummering.

Suggested preventive measures include the selection of moderately open and well-drained planting sites, proper spacing and pruning, and the application of non-residual fungicides, starting in the autumn at the onset of cool, rainy weather.

BALDWIN (H. I.). **Needle blight in Eastern White Pine.** *Plant Dis. Reptr*, 38, 10, pp. 725–727, 1954. [Multilithed.]

A survey carried out by the New Hampshire Forestry and Recreation Commission, Concord, showed that the needle blight which caused widespread reddening

in July, 1954, of the foliage of scattered, individual white pines (*Pinus strobus*) [*R.A.M.*, 33, p. 693] in the State was not associated with fungus or insect attacks. The predominance of the disorder on trees in moist to medium moist sites indicates that a dry site alone is not the cause of needle blight, although it intensifies the symptoms. The fact that the summer of 1953 was abnormally dry and followed by a season of frequent rains supports the view of Felt and Rankin (Insects and Diseases of Ornamental Trees and Shrubs, 1932) that blight is related to deficient root action resulting from drought injury in the previous year.

Lightle (P. C.). **The pathology of Elytroderma deformans on Ponderosa Pine.**—*Phytopathology*, 44, 10, pp. 557–569, 4 figs., 1 graph, 1954.

Elytroderma deformans, first recorded as *Hypoderma deformans* by Weir (*J. agric. Res.*, 6, pp. 277–288, 1916), was renamed by Darker in 1932 [*R.A.M.*, 12, p. 254]. It is responsible for a witches' broom, which has become progressively more destructive of recent years, of ponderosa and Jeffrey pines (*Pinus ponderosa* and *P. jeffreyi*) and a needle cast of the same species and several others, e.g., *P. banksiana*, *P. contorta*, *P. echinata*, and *P. edulis*, in California, Oregon, and elsewhere in the United States and Canada.

The results of studies at the Division of Forest Disease Research, Placerville, California, demonstrated the importance in ascospore discharge of a combination of mild temperature and high moisture, both of which prevailed in the autumn of 1950. The fungus could not be induced to grow on any of the standard media tested, nor did the spores germinate to any appreciable extent even in the presence of stimulants such as sucrose or vitamins B_1 and B_2.

Within the needle, where the pathogen appears to traverse its entire life-cycle, the hyphae are confined to the mesophyll cells and the lacunae of the resin canals. Degeneration of the phloem tissue cells is induced by an unknown substance, probably a phytotoxin secreted only in the presence of the pathogen. The process is not limited to the needles, but extends through the short shoots and for an undetermined distance proximally in the twig. Groups of degenerating phloem cells frequently provide the stimulus for the production of resin cysts in the peripheral zone of phloem in the bark which are plainly visible to the unaided eye after the second year.

Hennig (R.). **Die biologische Ordnung der holzzerstörenden Pilze und ihre praktische Bedeutung.** [The biological classification of the wood-destroying fungi and its practical significance.]—*Holzzentralbl.*, 80, 56, p. 695, 1954.

The author divides the wood-destroying fungi of Germany [cf. *R.A.M.*, 32, p. 2; 33, p. 572] into two groups, saprophytes and perthophytes [cf. 9, p. 47], and some observations are made on the silvicultural importance of two representatives of the latter, *Trametes* [*Fomes*] *pini* [15, p. 472] and *Sparassis ramosa* [34, p. 6]. *F. pini* destroys the heartwood in pine and the whole trunk in spruce and fir [*Abies*], infection taking place through injuries. It may be controlled by stand sanitation; removal of dead branches in infested areas should be avoided. *S. ramosa* infects mainly pine, occasionally Weymouth pine [*Pinus strobus*], Douglas fir [*Pseudotsuga taxifolia*], and Sitka spruce, penetrating through dead and dying roots. Incidence is highest on well-aerated gravel soils. Since the disease cannot be controlled by sanitation, choice of planting site is important.

Rudd Jones (D.). **Studies on a canker of Cypresses in East Africa, caused by Monochaetia unicornis (Cooke & Ellis) Sacc. II. Variation in the morphology and physiology of the pathogen.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 286–305, 2 pl., 10 graphs, 1954.

In the course of a more detailed examination of the cultural characteristics of the

four strains of the cypress canker organism, *Monochaetia unicornis* [*R.A.M.*, 32, p. 65; 33, p. 191; 34, p. 4, and next abstract], comparisons of conidia from 50 collections of the fungus on *Cupressus* spp. from Kenya, Uganda, and Tanganyika showed that the seta length was the only dependable morphological character for separating strains A and B; the setae were significantly longer in B. Conidia of strain D (parasitic only on *Juniperus procera*) were wider and darker than those of A and B. The optimum growth temperature for these two was 25° C. and for D 20°. Strain A had the most 'parasitic' type of metabolism in culture, B was intermediate, and D had a 'saprophytic' type and was strongly antagonistic to the others. Mycelial growth of A and B was optimum at 97·5 per cent. relative humidity while conidial germination was favoured by a saturated atmosphere. Strain D grew at about the same rate over a wide humidity range but the optimum for conidial germination was 97·5 per cent. A and B grew best on an agar medium enriched by 10 to 20 per cent. sucrose and D by 40 per cent. B and D tolerated higher osmotic pressures in liquid culture than A; conidia of D germinated best at an osmotic pressure of 4 atmospheres.

It is suggested that the distribution of B and D is limited by climate, B being able to compete with A only on dry sites. A and B are considered to be biotypes of one species while D is probably a separate species or variety.

Rudd Jones (D.). **Studies on a canker disease of Cypresses in East Africa, caused by Monochaetia unicornis (Cooke & Ellis) Sacc. III. Resistance and susceptibility of species of Cupressus and allied genera.**—*Ann. appl. Biol.*, 41, 2, pp. 325–335, 1954.

In further studies in Kenya on cypress canker (*Monochaetia unicornis*) [see preceding abstract], when five species of *Cupressus* were grown in plots interplanted with and surrounded by inoculated *C. macrocarpa*, 13 uninoculated *C. macrocarpa* [*R.A.M.*, 33, p. 16] trees became infected, the corresponding figures for *C. arizonica*, *C. benthami*, *C. lusitanica*, and *C. torulosa* being 4, 3, 7, and 1. Observations on the extension of cankers in inoculated *C.* trees indicated that resistance appeared to depend on a rapid reaction of the host tissues rather than on an unfavourable nutrient condition of the host for the pathogen. When trees of each of the five species were given a standard wound and inoculated with mycelium of *M. unicornis* (strain A), in most cases the longer the interval between wounding and inoculation the fewer were the successful infections obtained. At six and 14 days after wounding, however, infections were unexpectedly numerous, presumably because of heavy rainfall at the time of inoculation. No significant difference in length was apparent between cankers on *C. benthami* and on *C. macrocarpa*, but *C. lusitanica* cankers were significantly shorter, and those on *C. torulosa* the shortest. In April, 1951 (five months after inoculation), over 80 per cent. of the *C. macrocarpa* cankers were still active, as compared with 36, 25, and 20 per cent. for *C. lusitanica*, *C. benthami*, and *C. arizonica*, respectively. There were no active cankers in *C. torulosa*.

In a similar experiment in January, 1952, at the end of the rains, when the water content of the bark and sapwood and the moisture available to the fungus were decreasing, there were fewer infections in all species; 40 out of 80 *C. macrocarpa* trees had active cankers, as compared with 28 *C. lusitanica* trees. The cankers did not extend very rapidly in the drier weather at this period, and the mean canker length was much less than in the earlier experiment. In April 60 per cent. of the *C. macrocarpa* and 35 per cent. of the *C. lusitanica* cankers were still active. These results further confirmed the view that host reaction was the major factor controlling resistance. The inner tissues of species with thick bark formed wound periderm slowly, the species with the thickest bark and the most rapid secondary growth being the most susceptible. In conditions of heavy rainfall, with delayed

inoculation after wounding, the difference between thin- and thick-barked species is not so apparent, but in the dry season infections in thin-barked species tend to dry out, and only in thick bark can the fungus persist without desiccation or limitation by host reaction. This applies to species with about the same height-growth rate. In slower-growing species, such as *C. torulosa*, even though the bark is thick, there is not a sufficient supply of mobile food substances passing to the infected part to enable the fungus to make rapid growth. It was observed in Kenya, as in Arizona [cf. 27, p. 545], that when a plantation was thinned, cankers on the remaining trees tended to develop more rapidly. The available evidence indicates that *M. unicornis* spreads most rapidly in species with a rapid height-growth. The fungus can persist, however, in an active, or potentially active, state only when rapid height-growth is accompanied by rapid secondary growth. These requirements are satisfied only by *C. macrocarpa*.

Foster (R. E.) & Foster (A. T.). **Estimating decay in Western Hemlock. I. Suggested aids to the inventory in the Queen Charlotte Islands. II. Suggested aids to utilization in the Queen Charlotte Islands. III. Suggested aids to the management of mature Hemlock-Spruce forests on the Queen Charlotte Islands.**—*B.C. Lumberm.*, 36, 11, pp. 42–43, 93, 96, 100, 118, 1952; 37, 4, pp. 40–41, 56, 58, 102, 7 figs.; 10, pp. 42–47, 5 figs., 1 graph, 1953.

Methods are described for assessing saleable decay-free timber in overmature stands, for utilizing the various grades of timber, and the application of forest management principles to mature and overmature stands, with particular reference to western hemlock [*Tsuga heterophylla*] in the Queen Charlotte Islands, British Columbia.

Blew (J. O.). **Comparison of wood preservatives in stake tests (1953 and 1954 Progress Reports).**—*Rep. For. Prod. Lab., U.S. Dep. Agric., For. Serv.*, D 1761, 41 pp., 1 fig., 1953; 42 pp., 1 fig., 1954. [Mimeographed.]

In further progress reports on stake tests begun in 1938 by the Forest Products Laboratory, Madison, Wisconsin [*R.A.M.*, 31, p. 311] the following results among others were obtained. In Panama southern yellow pine [*Pinus* spp.] stakes pressure-treated and retaining 0·2, 0·3 and 0·6 lb. per cu. ft. tanalith [loc. cit.] had an average life of three, six and 12 years respectively. Similar stakes absorbing 0·2 lb. tanalith and 0·25 lb. sodium tetrachlorophenate lasted for 10 and eight years, respectively, in Louisiana. Those treated with phenyl mercury oleate in naphtha had an average life of five to eight years in Mississippi.

Southern pine stakes and Douglas fir [*Pseudotsuga taxifolia*] stakes superficially treated without pressure with coal-tar creosote, pentachlorophenol, copper or zinc naphthenate, or phenyl mercury oleate lasted one to four years longer than the untreated controls. Pine stakes treated by the double diffusion method [loc. cit.] with copper chromate and copper arsenate are still serviceable after 12 years in Mississippi.

Plywood impregnated with phenolic resin or impregnated and compressed was more resistant to fungal decay than untreated.

Blew (J. O.) & Kulp (J. W.). **Comparison of wood preservatives in Mississippi post study (1953 and 1954 Progress Reports).**—*Rep. For. Prod. Lab., U.S. Dep. Agric., For. Serv.*, R 1757 (revised), 4 pp., 1953; 15 pp., 1954. [Mimeographed.]

Further results from the timber preservation tests in progress at the Harrison Experimental Forest, Saucier, Mississippi [*R.A.M.*, 31, p. 310] showed that untreated southern yellow pine [*Pinus* spp.] and longleaf pine [*P. palustris*] fence

posts had an average life of 3·3 and 2·3 years, respectively. On the basis of withdrawals up to date southern yellow pine posts treated with β-naphthol in oil, borax-boric acid, 10 per cent. creosote plus 90 per cent. crankcase oil, crankcase oil alone, sodium chromate, and osmoplastic, the last-named at ground level and above [loc. cit.], have an average life of 12 to 16 years. Pressure-treated posts with 6·7 lb. per cu. ft. pentachlorophenol (4·82 per cent. in crankcase oil), tetrachlorophenol (4·83 per cent. in crankcase oil), and zinc meta-arsenite are still in use after 16 years.

HARMSEN (L.). **Om Polyporus caesius og Ditiola radicata som tømmersvampe.** [On *Polyporus caesius* and *Ditiola radicata* as timber fungi.]—*Bot. Tidsskr.*, 51, pp. 117–123, 11 figs., 1954. [English summary.]

Polyporus caesius is found on both hard- and softwoods in Danish forests, producing fissures similar to those caused by *Coniophora cerebella* [*C. puteana*]. It is readily isolated in pure culture from the flesh of fruit bodies or from diseased wood, but attempts at basidiospore germination have been unsuccessful. On malt agar the mycelium is white, slender, and irregular, with more or less distinct radial extensions in which it appears transparent and lustrous. The hyphae are very thin-walled and those of the submerged mycelium are furnished with numerous almost rectangular lateral branches. Hyphae of this type may be seen in recently inoculated spruce and pine wood. Some of the many clamp-connexions are medallion-shaped.

The importance of *P. caesius* as a timber fungus is negligible, partly because of its excessive humidity requirements and also on account of the slow progress of decomposition; in a four-month experiment the loss of weight in spruce and pine was 15 to 22 and 11 to 13 per cent., respectively. In nature the species is commonly found on wood already invaded by other fungi.

Ditiola radicata is most prevalent on manufactured wood, e.g., window-frames, beams, outer doors, benches, and fences, but it also occurs in the forest on spruce and pine logs exposed to sun and weathering, appearing in the form of whitish to orange-yellow, disk-shaped heads, 1 to 2 mm. in width, on short, thick stipes, 4 to 5 mm. in height, sometimes bi- or tripartite. The range of the fungus seems to be very limited in Norway and Sweden, as well as in Denmark. It causes a rot similar to that induced by *Lenzites sepiaria*. Growth in pure culture is very slow. The mycelium is dull white, compact, and tenacious, and the hyphae hyaline, thin-walled, somewhat sparsely branched, with few septa and no clamp-connexions. Structures resembling balls of yarn and composed of spirally winding hyphae are scattered through the aerial mycelium, in which are also produced numerous oblong, often slightly curved conidia, 3 to 6 by 2 μ, and thick-walled, hyaline, oval to spherical chlamydospores, 8 to 12 by 5 to 8 μ. The hyaline, sometimes uniseptate basidiospores, 9 to 10 by 4 μ, germinate readily on malt extract agar.

RØED (H.). **Soppskader på treverk.** [Fungal damage on timber.]—Reprinted from *Norsk Skogind.*, *1954*, 10, 7 pp., 1954. [English summary.]

Information is presented on the common forms of damage to timber in Norway caused by [unspecified] moulds and blue-staining fungi and rots associated, for instance, with *Armillaria mellea*, *Coniophora puteana*, and *Merulius lacrymans*. The appearance and mechanical properties of infected timber are described, and some general observations are made on the structure and chemical composition of wood and on fungal anatomy, nutrition, and dependence on environmental factors, particularly temperature and humidity.

DAVIDSON (R. W.) & LOMBARD (FRANCES). **Brick red stain of Sitka Spruce and other wood substrata.**—*Phytopathology*, 44, 10, pp. 606–607, 1 fig., 1954.

Ascocybe grovesii, described by Wells (*Mycologia*, 46, pp. 37–51, 1954) as occurring

on northern white pine (*Pinus strobus*) and other timber in Canada, was isolated from Sitka spruce heartwood in Oregon and Washington in 1944 and from Douglas fir [*Pseudotsuga taxifolia*] timber in the former State in 1946. In 1950 a comparison of the Canadian and United States samples at the Forest Disease Research Laboratory, Beltsville, Maryland, revealed that the fungus was identical in all of them. Later it was observed growing on red oak [*Quercus borealis*] heartwood in a moist chamber at the Laboratory. A brick-red stain on aircraft timber in the United States, reported by Hansbrough and Englerth in 1944, is thought to have been also caused by *A. grovesii*.

The stain on aircraft timber and on white pine appears to have been largely superficial, but the heartwood of the Sitka spruce logs was deeply penetrated and stained pale pink, the fungus mainly following the very inconspicuous compression failures. The brick-red surface stain is partly due to the red-brown tint of the ascophore stalks, but the actual colour produced by the fungus ranges from pink to cinnamon-brown.

Cultures of *A. grovesii* isolated about ten years ago have undergone little change, indicating that the species should be valuable for classroom studies in mycology. The addition of gallic or tannic acid to a malt agar medium did not significantly affect growth rate. From the fact of its development on such unrelated woods as Sitka spruce and oak *A. grovesii* would appear to be more or less indifferent in respect of its substratum. The production of sticky spore masses suggests an association with or dissemination by insects.

Akai (S.) & Ueyama (A.). **Effect of phenyl mercuric acetate upon the mycelial growth of some wood-destroying fungi.**—*Shokubutsu-Byogai-Kenkyu*, 5, p. 32, 1954. [Abs. in *Chem. Abstr.*, 49, 2, p. 1265, 1955.]

At Kyoto University, Japan, the mycelial growth of *Cortinellus shiitake* [*C. edodes*: *R.A.M.*, 18, p. 434; 32, p. 687], *Stereum induratum*, and *Fomitopsis* [*Fomes*] *pinicola* on malt decoction agar plus 1 per cent. sucrose was inhibited after six days by phenyl mercuric acetate at concentrations exceeding 10^{-4} *M*; at the same strength, however, it permitted development after nine days. The diameters (in mm.) of mycelial growth of *Polystictus versicolor*, *Trametes dickinsii* [31, p. 410], *T. sanguinea* [? *P. sanguineus*: 32, p. 157], and *T. albida* in agar plate cultures containing 10^{-4} *M* phenyl mercuric acetate were 3, 5, 27, and 6, respectively, after three days; 8, 14, 64, and 14 after six; and 10, 18, 77, and 19 after nine.

Chiba (O.) & Teramoto (T.). **Wood-rotting fungi collected in the Tokyo University forest in Hokkaido.**—*Bull. Tokyo Univ. Forests* 43, pp. 19–37, 1952. [Abs. in *Rec. Res. Fac. Agric. Univ. Tokyo, 1951–1952*, 2, p. 57, 1953.]

An account is given of the occurrence and significance of decay in forest trees in the Tokyo University Forest, Hokkaido. Conifers of small diameter and deciduous trees of large are seriously damaged by various fungi.

Lists of the most important fungi attacking living coniferous and deciduous trees and ties [sleepers] are given. A total of 93 species of wood-rotting fungi has been collected and identified.

Duncan (Catherine G.). **Soil-block and agar-block techniques for evaluation of oil-type wood preservatives: creosote, copper naphthenate and pentachlorophenol.** *Spec. Release Div. For. Path., U.S. Dep. Agric.*, 37, 39 pp., 5 figs., 1953. [Mimeographed.]

A comparative study of the soil- and agar-block techniques using oil-type wood preservatives was made at the Division of Forest Pathology, United States Department of Agriculture, Madison, Wisconsin [*R.A.M.*, 32, p. 226]. The soil culture

technique was superior to that of malt agar in that the soil provides additional moisture for decay fungi, and absorbs certain toxic substances which might kill the fungus during the test. The blocks used were ¾ in. cubes of longleaf pine (*Pinus palustris*) sapwood, and were tested with the fungi *Lentinus lepideus* [loc. cit.], *Lenzites trabea*, *L. sepiaria*, *Poria monticola*, and *Polyporus tulipiferus*. Nine different oil-type wood preservatives were employed: coal-tar creosote, penta-petroleum (a 5 per cent. solution by weight of pentachlorophenol in a light petroleum oil), copper-petroleum (a solution of copper naphthenate equivalent to 0·525 per cent. metallic copper in a light petroleum oil), penta-copper-petroleum, penta-petroleum-creosote, copper-petroleum-creosote, penta-copper-petroleum-creosote, petroleum-creosote, and petroleum oil.

The threshold retention values of the preservatives as found by the soil-block technique approached more closely those of field experience than those obtained by the agar-block method. The former method of testing preservatives has proved superior to the latter in indicating the relative effectiveness of preservatives in use, especially when the blocks are subjected to permanence tests including the effects of evaporation, leaching, and heat.

DUNCAN (CATHERINE G.). **Evaluating wood preservatives by soil-block tests: 6. Exploratory tests toward improving the method.**—Reprinted from *Proc. Amer. Wood Pres. Ass., 1953*, 7 pp., 2 graphs, 1953.

This paper on the soil-block method provides further information on the suitability of out-of-door weather as a permanence test, the significance of differences in the specific gravity of test blocks, and the minimum culture period necessary in exposing the blocks to infection by test fungi.

FRITZ (CLARA W.). **Decay in Poplar pulpwood in storage.**—*Canad. J. Bot.*, 32. 6, pp. 799–817, 2 pl., 1954.

A study was made from the autumn of 1950 to February, 1954 of deterioration of poplar pulpwood (*Populus tremuloides* and *P. balsamifera*) in field, pit, and block pile storage on Manitoulin Island, Ontario, in relation to the reaction to storage conditions of the rot fungi present in living trees and the penetration of fungi which attack wood after felling. The rots most prevalent in living trees and the most important from the standpoint of volume of wood affected were white trunk rots caused by *Fomes igniarius* var. *populinus* [*R.A.M.*, 32. p. 520]. *Radulum casearium* [loc. cit.], and *Polyporus dryophilus* var. *vulpinus* [32. p. 349]; a rot associated with a non-Basidiomycete designated fungus X, none of which was appreciably active in storage, and a destructive, cellulose-destroying brown rot caused by *Poria cocos* [34. p. 192] which spreads rapidly in storage and should be culled at the felling site.

Stereum purpureum was the first colonist of felled timber; it spread rapidly and fruited during the first summer. This species was followed by *Polyporus adustus* [cf. 31. p. 51]. *P.* [*Polystictus*] *hirsutus*, and *Polyporus* [*Polystictus*] *versicolor* which became established during the first summer, fruited on field and pit logs during the second season, and were fruiting luxuriantly on block pile logs which had been stored for three years. They produce white rots and in some logs caused advanced decay during two years' storage. The same pattern of decay and succession of fungi was found in all types of storage investigated.

POTTER (F. M.). **Creosote oil.**—*Wood*, 19, 9, pp. 368–369, 1954.

Information is presented on the history of creosote, first used as a timber preservative by Bethell in 1838, and its application in present-day practice. Among other points of interest may be mentioned an up-to-date theory that the efficiency of creosote is due to the fact that it contains some 160 constituents, including 25

or 30 major ones, each of which exerts a measure of toxicity on one or more wood-destroying fungi. Some of the compounds interfere with the metabolism of the pathogens, while others affect the constituents of the timber in such a way that they become useless as nutrients. The standard specifications ensure a blend of the toxic bodies, comprising the lower boiling hydrocarbons in the range from 215° to 315° C. and the higher boiling phenolic compounds within the same limits, with the high boiling hydrocarbons containing the heavy oils, distilling above 315°, which are chiefly important as a storage for the toxic elements but also serve to waterproof the wood and act as lubricants between the fibres under conditions of mechanical stress, e.g., in railway sleepers.

Bremer (H.). **Beobachtungen zur Wurzelfäule im Trockenklima.** [Observations on root rot in a dry climate.]—*Z. PflKrankh.*, 61, 11, pp. 575–587, 3 figs., 1954. [English summary.]

Crop plants originating in relatively humid countries tend to suffer from root rot when cultivated under irrigation in a semi-arid climate. The author's studies on this form of root rot, continuing those already described [*R.A.M.*, 25, p. 254; cf. also 26, p. 495; 33, p. 743], were carried out near Ankara, Turkey, on chilli, eggplant, and potato, which begin to wilt in the height of summer. In the early stages, the symptoms may be remedied by a plentiful water supply, but later the wilt becomes irreversible.

Fungi isolated from the roots of diseased plants, of which potatoes were the most susceptible, included species of *Fusarium*, especially *F. solani* sensu lato, and *Cylindrocarpon*, *Macrophomina phaseoli* [33, p. 451], and *Colletotrichum atramentarium* [cf. 33, p. 686], all soil inhabitants and weak parasites. In inoculation experiments with *M. phaseoli* and *F. solani* on chilli and bean [*Phaseolus vulgaris*] wilt occasionally developed on sterilized soil only. The culture filtrates of both fungi were injurious to bean but not to chilli, eggplant, or potato. *M. phaseoli*, *F. solani*, *Rhizoctonia* [*Corticium*] *solani*, and *Colletotrichum atramentarium* were also isolated from the roots of healthy tomatoes and various weeds, e.g., *Polygonum* sp., *Salsola kali*, *Amaranthus reflexus*, *Convolvulus arvensis*, and *Cynodon dactylon*, growing in the same field as the diseased plants.

Frequent irrigation reduces the wilting to a minimum only if the soil is kept permanently moist.

Kole (A. P.). **Waarnemingen over het gedrag van zoösporen uit de zoösporangia van Olpidium brassicae (Wor.) Dang.** [Observations on the behaviour of zoospores of *Olpidium brassicae* (Wor.) Dang.]—*Tijdschr. PlZiekt.*, 60, 3, pp. 135–137, 3 figs., 1954. [English summary.]

The examination under the phase contrast microscope at the Agricultural College, Wageningen, Holland, of material stained by Couch's modification of Löffler's method (*Amer. J. Bot.*, 28, pp. 704–713, 1941) of *Olpidium brassicae* from young cabbage roots showed that biflagellate zoospores result from fusion of originally uniflagellate individuals. Some specimens were observed with three or more flagella. The same phenomenon was attributed by Kusano (*J. Coll. Agric., Tokyo*, 3, pp. 141–199, 1912) in the case of *O. viciae* [*R.A.M.*, 15, p. 659] to the non-occurrence of the final division, but it seems more probable, by analogy with *O. brassicae*, that it was also caused by the fusion of individuals.

Akai (S.) & Oishi (C.). **The effect of expressed sap of plant cell upon the activity of protopectinase of Bacillus carotovorus.**—*Shokubutsu-Byogai-Kenkyu*, 5, pp. 15–17, 1954. [Abs. in *Chem. Abstr.*, 49, 2, p. 1158, 1955.]

At Kyoto University, Japan, the expressed cell sap of radish, carrot roots, and

onion bulbs accelerated the protopectinase activity of *Bacillus carotovorus* [*Erwinia carotovora*], whereas that of squash petioles significantly inhibited it.

TAKESHITA (R. M.). **Studies on the white-rust disease of Horseradish incited by Albugo candida (Pers.) Kuntze.**—*Diss. Abstr.*, 14, 10, pp. 1493–1494, 1954.

A study at the University of Illinois on white blister of horse-radish caused by *Albugo candida* [*Cystopus candidus*] which has long been a problem in the State [*R.A.M.*, 34, p. 69], demonstrated that the sporangia germinated from pH 3·5 to 9·5 (optimum 4·5 to 7·5). Temperatures of 10° to 15° C. were optimum for indirect germination, 10° to 20° for zoospore germination, 15° to 25° for germ-tube elongation, and 15° to 20° for infection. At a constant temperature of 20° the sporangia lost their viability rapidly (in one to 12 hours) at relative humidities below 90 per cent. and in 8 to 16 hours at humidities above this figure; they germinated only in the presence of free moisture. The latent period of incubation was shortest from 20° to 28°. The fungus grew most rapidly through the leaf and sporulated most abundantly from 15° to 20°.

When young and old plants of a limited number of cruciferous crops were inoculated with sporangia from horse-radish, infection was obtained only on cauliflower seedlings. Cross-inoculation experiments with sporangia from horse-radish and shepherd's purse [*Capsella bursa-pastoris*] were negative. The fungus appeared to be introduced with each annual planting of infected sett-roots. Sett infection may occasionally arise from mycelium growing down to the sett-roots following infection originating in the crown of the main root, the extent of mycelial invasion downward being inversely related to the diameter of this root. Infection of sett-roots as evidenced by the development of systemically-infected shoots was readily obtained by inoculating sett-roots possessing buds with a sporangial suspension.

Oospores [loc. cit.] were found only rarely in commercial fields. They formed far more abundantly in plants in the reproductive phase than in those in the vegetative state and in hybrid plants resulting from certain crosses between the common and Bohemian horse-radish varieties showing some degree of resistance to *C. candidus*.

KOCH (F.). **Die Bedeutung von Fruchtfolge und Vorfrucht für den Cercospora Befall.** [The significance of crop rotation and the preceding crop in relation to *Cercospora* attack.]—*Zucker*, 7, 17, pp. 366–368, 1954.

The results of investigations in 1951 on 58 sugar beet undertakings in Bavaria indicated that the various types of crop rotation practised and the immediately preceding crop did not significantly affect the incidence of infection by *Cercospora beticola*.

KNAPP (E.). **Können Cercospora-Infektionsquellen im Feld über mehrere Jahre erhalten bleiben?** [Can sources of *Cercospora* infection in the field be maintained for several years?]—*Zucker*, 7, 8, pp. 169–170, 1954.

In 1953 a strip 46 m. wide in the middle of a stand of Kleinwanzleben N sugar beets at the Rosenhof branch of the Max Planck Breeding Institute, near Ladenburg on the Neckar, Germany, was attacked much earlier and more severely by *Cercospora beticola* [*R.A.M.*, 34, p. 15] than the rest of the crop. It was ascertained that in 1951 the strip in question had also been under sugar beet, whereas on the left- and right-hand sides potatoes and maize, respectively, had been cultivated. In 1952 the entire plot was under winter wheat. Evidently, therefore, the conidia or sclerotia produced in 1951 must have remained viable in the soil for nearly two years or the fungus must have maintained itself during the same period on dead plant residues.

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